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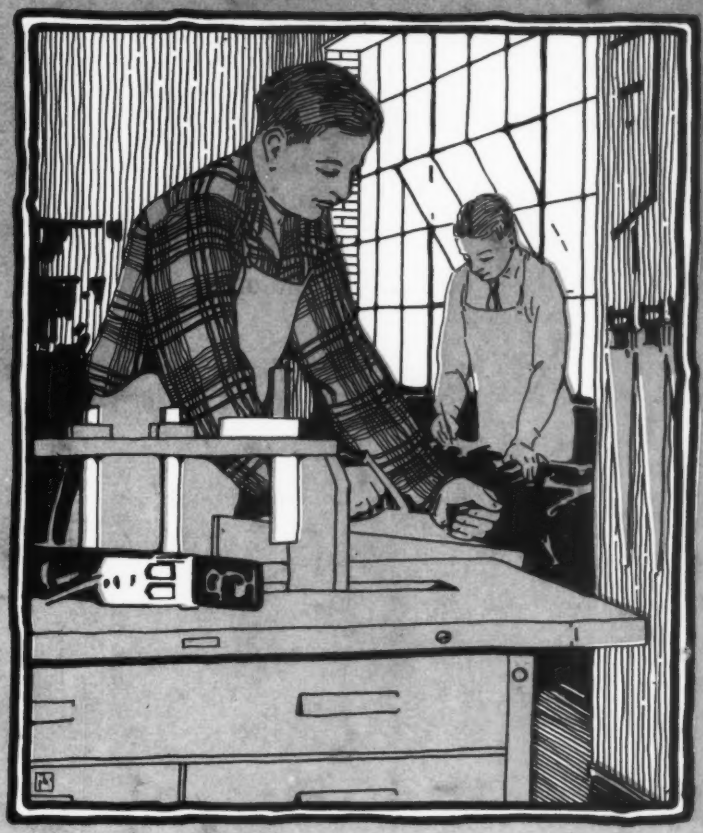

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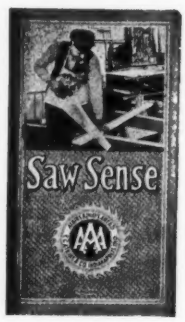

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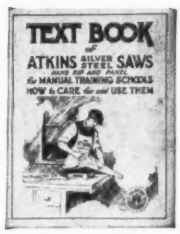

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THE INDUSTRIAL ARTS MAGAZINE

Volume XVI MARCH, 1927 No. 3

THE TEACHER'S PLAN

R. W. Selvidge, University of Missouri

ONE OF the most profitable things a teacher can do is to ask himself this question, "What do I expect my pupils to be, to know, and be able to do, at the end of the year, as a result of their experience and my teaching in this subject?" and then answer the question, unbiased by speculative theories or fanciful hopes. It is of no particular value to state these things in terms of "general objectives" or indefinite and high-sounding terms. They should be stated in terms so simple, so definite, and so exact that every pupil may understand them readily. Such a statement supplies definite goals, and when the student knows exactly what he is expected to do, he is much more likely to do it than when the requirement is hazy and indefinite. This applies to every subject in the school.

It may be granted that to write out such a list is a difficult task, but unless one can make a list of the principal things he expects the pupil to know when he has finished his period of training, the chances are the teaching will be indefinite and uncertain. In shopwork it is likely to result in simply *making* things. It is by no means necessary that the list be a complete one in the beginning; it should be made as complete as possible, and as each new point arises add it to the list. In this manner the list soon becomes quite complete. Sometimes an item may be placed which it is not feasible to teach; in some cases it should be struck out.

A Suggestive List of Accomplishments

In order to illustrate what is meant, and to give some suggestions for working out the plan, the following list is submitted. It is a list of the things we would expect a boy to know and be able to do at the end of the ninth grade, after completing five ninety-minute periods per week in woodwork. This list may not be as complete as it should be, or it may contain things that we should not expect of the boy, but it offers a basis for work. Any teacher may add to it, take from it, or substitute in any way necessary to adapt it to his particular requirements. The important thing is that when he has finished working on the list he may be able to say, "These are the things I expect the boys to know and be able to do at the end of the year." The principal, the teacher, and every boy should have a copy of the list and it should be understood that the boys will be checked at frequent periods throughout the year and at the end of the year. To the boy it will be a definite list of the things he must learn; to the teacher it will be a definite list of the things he must teach, and to the principal it will be a list by which he may check the success of the teacher and the progress of the boys. It will no longer be necessary to judge the progress of the boys by the amount of repairwork done on the school building, the number of pieces of furniture made, or the amount of material used. It will reveal to the principal that the primary purpose is to teach something rather than to make something.

We should not overlook the fact that this list represents the boy's accomplishments at the end of the ninth grade and not what we expect to teach him in that grade. The items that will be taught him in that grade will depend upon his previous training and experience, and these should be taken into account. At as early a date as possible the pupil's proficiency in any of the items should be determined and he should receive credit on the list. This provides for a recognition of individual accomplishment.

Listing Items on Basis of Frequency and Importance in Use

It is not necessary to arrange the list in the order of difficulty. The pedagogical half truth that "the material of instruction should be arranged in the order of learning difficulty" has been repeated so often and with so much authority that it is generally accepted as the whole truth. In our love for fine phrases we forget that importance and frequency in use are first considerations. For example, it probably would be granted that it is easier to learn to spell the word "ken" than the word "receive," but in preparing a list of words that a child should learn to spell we would not place "ken" before "receive." It is better to arrange the items with some respect to their frequency and importance in use. A thing that is to be used frequently should be taught early in the course even though it is more difficult to learn than a thing that is used rarely.

It will be found that pupils make very unequal progress and we may not expect all of them to reach the same point in our list. In order to take care of this difficulty it is advisable to divide the list into about three divisions. It should be stated that each boy is expected to complete the first group; that the good workers will complete the first and second groups, and the exceptionally good workers will complete the entire list.

The Lists

At the end of one year of woodwork in the high school (equivalent to one unit) a boy should be able to do the following:

1. Read a working drawing and make out a bill of material.
2. Check all material when received.
3. Measure and divide spaces with a rule.
4. Use a pencil, a knife, or an awl for marking.
5. Use the dividers, or compass, for laying out curves and for laying out and dividing spaces.
6. Gauge with a marking gauge or a pencil.
7. Use a try square for laying out square cuts.
8. Sharpen and adjust a plane.
9. Plane a surface true.
10. Plane end grain.
11. Square up a board.

12. Lay out pattern on stock.
13. Sharpen edge tools.
14. Saw to a line.
15. Sharpen a saw.
16. Use a scraper.
17. Sharpen a scraper.
18. Bore holes.
19. Sharpen auger bits.
20. Use a T-bevel.
21. Fasten with screws.
22. Sharpen a screwdriver.
23. Drive and draw nails.
24. Use a brad awl.
25. Lay out and plane a chamfer.
26. Use sandpaper.
27. Put on locks.
28. Put on hinges.
29. Apply stain.
30. Apply fillers.
31. Apply shellac.
32. Apply wax.
33. Apply varnish.
34. Prepare glue.
35. Glue up work.
36. Use handscrews and clamps.
37. Use a spokeshave.
38. Lay out duplicate parts.
39. Lay out and cut a dado.
40. Cut out a groove or a rabbet.
41. Lay out and cut a cross-lap joint.
42. Lay out and cut a miter joint.
43. Lay out and cut a haunched mortise-and-tenon joint.
44. Make a dowel joint.
45. Lay out and cut a blind mortise-and-tenon.
46. Lay out and cut a through mortise-and-tenon joint.
47. Construct a panel.
48. Lay out and cut a housed joint.
49. Lay out and cut a rabbet joint.
50. Make a glue joint.
51. Adjust a combination plane for cutting grooves and rabbets.

He should have accurate information concerning the following:

52. Lumber: Kinds of lumber in common use, sources of supply, characteristics, uses, cutting and milling operations, drying, and the effect of moisture on wood.
53. Finishes: Object of finishes, kinds of finishes, materials from which they are made and the places in which the various kinds of finishes may be used to advantage.
54. Glue: Kinds of glue, its preparation and conditions of use.
55. Nails: Kinds, classification, how sold, uses and manufacture.
56. Screws: Kinds, sizes, classification and uses, how sold.
57. Sandpaper: Kinds, grades, and uses.
58. Styles of furniture.
59. Information with respect to manufacturing processes, the division of labor, source of materials, and use of product in a number of industries—particularly those represented in the local community.

The following attitudes or traits should be fairly well established:

60. Industry.
61. Cooperation.
62. Consideration for others.
63. Self-reliance.
64. Readiness to assume responsibility.

All of these are involved in practically every project undertaken.

The Purpose of the List

Some educational theorists look upon such a list as this with much misgiving. It is too simple and direct. To pick out a list of things you expect a boy to know by a given time, to let the boy know in the beginning what these things are, and then to aid and direct him in learning these things takes much of the mystery out of teaching and reveals to some degree the mummery that clutters up our teacher-training courses. The educative process offers an excellent field for the theorist. He may sit in his study, far removed from contact with the real situation, and develop some very beautiful and logical theories—if you grant his premise—which it will require years to test, and in the meantime most of the children will grow up into pretty decent citizens in spite of us.

To some people such a list suggests the return to the old exercise method of thirty years ago, but they usually are those who are not familiar with the actual conditions of shopwork. We need not fear a thing because it has an ancient sanction. The decalog dates from a rather remote period and yet there are some of us who would not abandon it entirely. In method it does not conform to some of our modern educational theories, but its effectiveness might suggest something with respect to form. We should not overlook the fact that the old exercise method was based upon a pretty thorough analysis for the purpose of picking out the fundamental processes to be taught; the weakness lay in the fact that these processes were taught as isolated things and not in connection with their application in some productive undertaking. The resulting difficulty was not so much a lack of interest in the work as is generally supposed, as it was a lack of ability on the part of the pupil to appreciate the importance of the process or to give it a practical application. Along about this period in our educational history the doctrine of interest became the vogue, and in some quarters it was carried to such absurd extremes that the interest of the child was held to be the only guide to what we should teach. We overlooked the fact that content is determined largely by individual and social needs and that interest is one of the factors in determining method. This attitude wth respect to interest led to the practice in the shop of *making things* to the almost total neglect of actual instruction in the manipulative processes. The educational theorist again got in his work with the theory that skill with tools and knowledge of the best construction methods would be developed incidentally. The crude workmanship revealed in the product gave abundant evidence that we got neither and is a sufficient justification for much of the criticism that has been directed at the manual arts work. As a matter of fact the theory that skill will be developed incidentally violates common sense and the best established laws of psychology. Skill represents an exact and an efficient habit and we learn to conform to an exact ideal only by a conscious and painstaking effort. The theorist assumes that the pupil will discover that he must develop the skill in order to make his product function. This, again, is a theory entirely divorced from facts. An article may function as a table without there being in it a single element of what would be regarded as good or skillful workmanship.

Many teachers with high ideals with respect to skill have clung to the idea that there is something to be taught as well as something to be made, and they are the ones around whom the rehabilitated manual arts movement is centering.

The Solution of the Problem

The solution of the problem lies in a wise combination of the extremes. The list of the things to be taught or learned must have a prominent place as the specific objectives of the course and the progress of the pupils should be checked against this list. The teacher must realize that it is his job to teach these things. This does not mean that these things are to be taught as independent or isolated things but as a part of some worthy undertaking. To be effective, however, the teacher must recognize these things as parts of the job and put forth a conscious and determined effort to teach them. In this way the pupil not only is taught the skills and methods of construction but he sees them in their practical application.

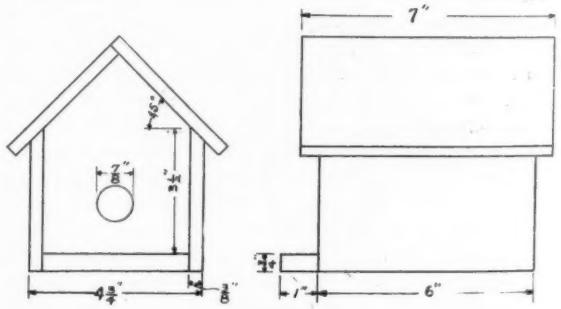


FIGURE 1.

THE BIRD HOUSE

ANALYSIS: The following instruction units are involved: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 14, 18, 20, 23, 26, 29, 38, 52, 53, 55, 57, 60, 62, 63, 64.

Some teachers have encountered difficulties in working out a satisfactory plan for carrying on the work in this manner. The following plan is simple, effective, and has the merit of being flexible. After the teacher has arranged his list, he should select the projects that have the following characteristics:

1. Simple enough to be within the capacity of the boy.
2. Handled readily under the schoolroom conditions.
3. Completed in a short period of time.
4. Has a real use in the estimation of the boy.
5. Contain some of the elements the teacher wishes to teach.

Checking the Items in the Several Jobs

Having selected a series of jobs on this basis, the teacher should take the drawing for each job and the list of things he wishes to teach, and check the things involved in the particular job. This enables him to determine what instructions will be required, and what experiences will be obtained in doing the job. He should then make a plan for doing the job, that is, he should write out the principal steps in the order of procedure. The drawing, the analysis for the instruction units involved, and the plan for doing the job, should be filed together for future use. Projects involving approximately the same units of instruction should be grouped together. This gives a maximum of flexibility as a great variety of projects may be placed within a group. Projects should be selected and analyzed until every instruction unit has been provided for. New jobs should be added as worthy ones come to the attention of the teacher. This does not preclude a student from suggesting a new job, or modifying one already on the list, but no job should be approved until it is analyzed and the instruction units listed. This material is for the use of the teacher, not the pupil. The pupil is given the drawing and the specifications, and is required to plan the job. The teacher should then ascertain whether the student knows how to perform each step as indicated in his plan.

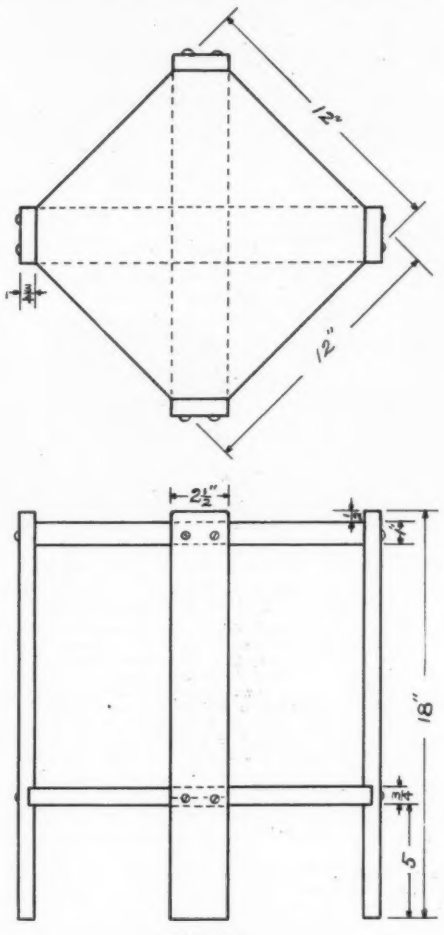


FIGURE 2.

THE PLANT STAND

ANALYSIS: The following instruction units are involved: 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 18, 20, 21, 26, 29, 30, 32, 38, 39, 41, 52, 53, 56, 57, 60, 62, 63, 64.

Instruction Sheets Effective for Instruction Purposes

Perhaps the most effective way of giving the necessary instruction is through the use of instruction sheets and occasional demonstrations. Instruction sheets based upon the items of the list are more effective than those based upon the jobs. If instruction sheets are prepared for each of the items of the list, they may be used in any job where the particular unit of instruction is required; instruction sheets based upon particular jobs are limited to those jobs, and the instructions must be repeated for every item unless the jobs are arranged in a fixed order. The instruction sheet based upon the job takes from the boy the opportunity to plan his job and this is one of the important parts of his training. There is no difficulty in getting a boy to read instructions provided they tell him clearly how to perform a task. This test is looked upon by the pupil as a worthy accomplishment in which he has an opportunity to show his proficiency and to receive recognition of his ability. The success in training boy scouts is due largely to the recognition of this fact.

Two simple projects that are in common use are shown in Figs. 1 and 2 in order to illustrate the plan of analysis. The analysis is based upon the list as arranged above.

Below are the job plans for each job. It will be observed that they do not coincide exactly with the units of instruction. They represent the principal steps in the order of procedure, and in more advanced projects one step might include a number of units in which instruction would be required if it were to be done by a beginner. These are the job plans for the teacher's files and not to be given to the pupil. The pupil should make his own job plan and have it approved by the teacher.

Job Plan for Bird House

Order of Procedure:

1. Make out bill of material.
2. Check material.
3. Square all pieces to exact size.
4. Lay out ends and sides.
5. Cut ends to shape.
6. Bore hole in end piece.
7. Bevel side pieces.
8. Nail bottom to end pieces.
9. Nail sides to end pieces and bottom.
10. Nail on top—nail narrow piece on first.

Job Plan for Plant Stand

Order of Procedure:

1. Make out bill of material.
2. Check material.
3. Square legs, top, and cross pieces to exact dimension.
4. Lay out top.
5. Lay out legs.
6. Lay out cross pieces.
7. Cut cross-lap joint in cross pieces.
8. Cut dado in legs.
9. Bore holes for screws.
10. Cut corners off of top.
11. Sand.
12. Assemble.
13. Stain.
14. Fill.
15. Wax and polish.

The Working Out of Projects

It will be clear to any teacher that if the pupil is furnished with such a plan his thinking is all done for him. He should be required to make a plan of his own without seeing the plan the teacher has worked out. The teacher should question the pupil about each step in the plan until he is sure the pupil knows how to proceed in each step. This planning by the pupil should never be neglected.

All jobs or projects to be used should be worked out in this manner and filed in groups or divisions with respect to the principal operations involved. The teacher should so select the projects that the pupil will obtain greater practice in the skills most frequently used.

Most of the industrial information has as much relation to one project as another, and it is unwise to try to fasten it to some particular project. For example, information concerning the manufacture of saws or the manufacture, kinds, sizes, and uses of nails is interesting and useful, but a boy will not cheerfully stop building a bird house to enter into a long discussion of these things. If, however, he is given to understand that on a certain date there will be a contest to see who can make the best record in classifying a number of sample nails, and material is available for study and practice, he will surprise you with the accuracy of his knowledge. We must not minimize the importance of this information but matters of general interest should be presented through charts, exhibits, readings, reports, and class discussion.

Attitudes, unlike skills, may be developed incidentally. They are largely the result of ideals and boys should know what is expected of worthy men in a community. They should know the qualities in men that make us respect them and that contribute to their success. For example, they should know that employers seek men who are cordial and pleasant in their association with their fellow workers and who are courteous and considerate of the public, and that a frown and the ability to say unkind things are not assets in any business. They should know that a man who can take a job, plan it, and work it out on his own responsibility is a much more valuable man than the one who must be told how to do everything. The teacher should definitely plan to create situations calling for the exercise of those traits he wishes to develop.

BROWSING TABLES IN MANUAL EDUCATION ROOMS

Horace M. Clark, Clifford Street School, Los Angeles, Calif.

SINCE READING TABLES, or "browsing tables," where pupils may spend part of their spare time after the required work has been finished, have begun to appear in the regular classrooms, why might not the same prove to be of value in the manual education room as well?

A fundamental principle of the browsing table idea, especially from the point of view of the manual education teacher, is that a pupil should be given the opportunity to cultivate the desirable interests and tendencies inherent in his own nature. This, according to some authorities, is one of the important ends and aims of all education.

The inclusive nature of the work in manual education admits of a wide and varied selection of material appropriate for the purpose we are discussing. Even should the choice be limited to books, periodicals, and pamphlets of a strictly practical nature, there are more than enough of these, easily obtainable, from which choice may be made.

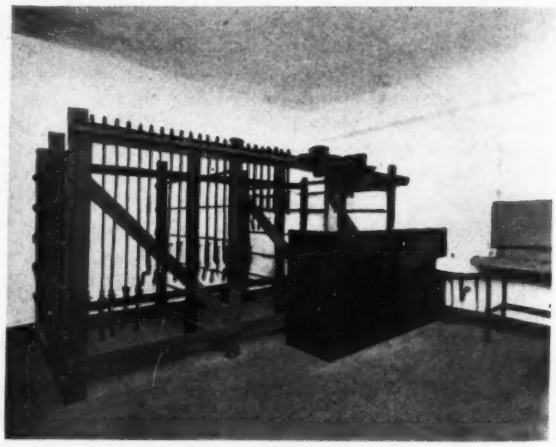
In the city and county libraries and in the school library as well much desirable material is available. Volumes concerning various constructive activities for boys, such as work in wood, metal, and various other materials; books about airplanes, radios, ships, engines, and machines of all sorts may be obtained. Books relating to manufacture and industry in general may also be included. In fact almost any book of a practical trend, even though technical to a degree seemingly beyond the comprehension of an elementary pupil, may have its place on a manual education browsing table.

It may be well to state that it has been found advisable to provide all books with covers of a durable type, preferably dark in color.

Next come the magazines, of which there is almost as great a variety as of books. Popular magazines on mechanics, science, invention, radio, and automobiles are in great demand. Engineering, furniture, electrical, mining, metallurgy and other subjects have been found to be of great interest to some of the boys. The back numbers are almost as desirable for our purpose as the current issues, but because of the ease with which such material may be obtained, it should not be necessary to use any periodicals which are more than two years old.

Certain publications of the local chamber of commerce may also be found most useful and interesting as browsing table literature.

Informational instruction has of late years been considered an especially valuable accessory to courses in elementary manual work. Lastly, as a disciplinary aid alone, a browsing table has been found to be more than worth while.



A CORNER IN THE WOOD STORAGE AND WOOD FINISHING ROOM OF A STANDARD JUNIOR HIGH SCHOOL WOODWORKING SHOP, MINNEAPOLIS, MINN.

The storage room, connected with the wood shop, serves both for lumber storage and wood finishing and measures 18′ x 18′. It contains a lumber rack made entirely of metal, measuring 6′ x 12′ and containing six "pipe" shelves. The cabinet immediately in front of the lumber rack is entirely steel and fireproof and is used for storing paints and other wood finishing materials. The bench to the right is 7′ long and is used for finishing purposes. It contains an electric light socket for the glue pot. One side of the room contains bins for unfinished work. These are 11′-2″ long and extend from floor to ceiling. It will be noted that the lumber rack also serves to hold clamps and hand-screws.

STANDARD ELECTRICAL, SHEET METAL, AND WOODWORKING SHOPS IN THE JUNIOR HIGH SCHOOLS, MINNEAPOLIS, MINN.

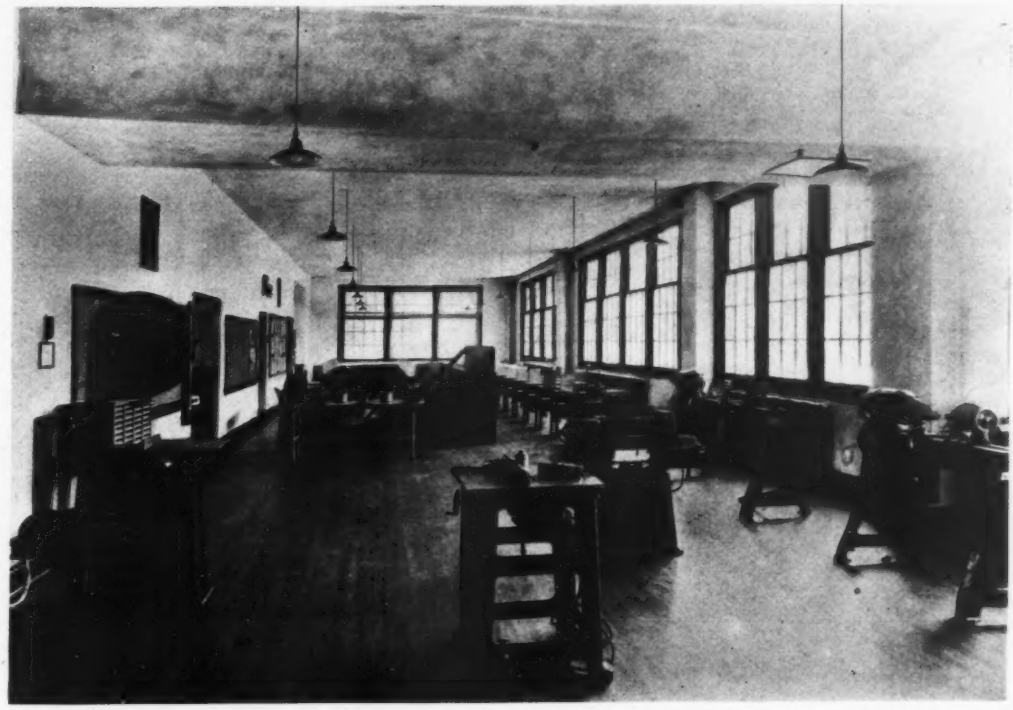
(See Page 83)

The combined length of the two rooms is 109′ and the width 23′. The electrical shop is equipped with four benches for wiring, each measuring 2′-6″ x 6′ and two work benches measuring 2′ x 3′-6″. The instructor's bench measures 3′-6″ x 1′-10″. The recitation seats are 12′ long. The sheet metal department contains a table for the brake, measuring 2′-3′, a machine bench measuring 2′-6″ x 6′-2″, a laying-out bench measuring 6′-3″ x 2′-8″, a stake bench and a soldering bench, each measuring 6′-3″ x 2′-8″, and a grinding bench measuring 2′ x 4′. The shop contains thirty woodworking benches, each measuring 3′-6″ x 1′-10″. The teacher's demonstration bench in the wood shop measures 1′-10″ x 3′-6″.

NEW SCHOOL SHOPS IN MINNEAPOLIS

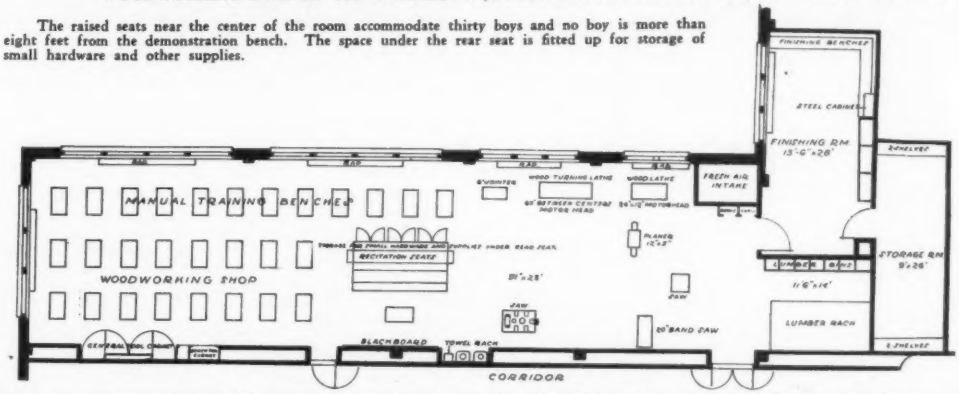
A Picture Story of the Complete Layouts and Equipments Developed

By J. E. Painter, Supervisor of Manual Training



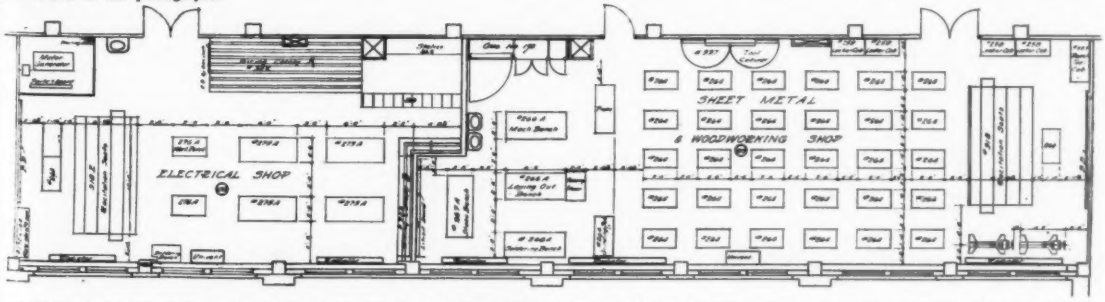
WOODWORKING SHOP AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS, MINN.

The raised seats near the center of the room accommodate thirty boys and no boy is more than eight feet from the demonstration bench. The space under the rear seat is fitted up for storage of small hardware and other supplies.



FLOOR PLAN OF THE WOODWORKING SHOP AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS, MINN.

The main shop measures 91′ x 23′; the lumber alcove measures 11′-6″ x 14′; the finishing room measures 13′-6″ x 28′; and the storage room measures 9′ x 26′. The machinery includes a 6″ jointer, a 60″ wood turning lathe, a small motor head lathe, a planer, a bench saw, a band saw, and a combination mortise-and-tenon machine. The general tool cabinet, bench tool cabinet, the lumber rack, and other typical permanent equipment of the room are illustrated and described in the photographs.



FLOOR PLAN OF THE STANDARD ELECTRICAL, SHEET METAL AND WOODWORKING SHOPS IN THE JUNIOR HIGH SCHOOLS, MINNEAPOLIS, MINN.

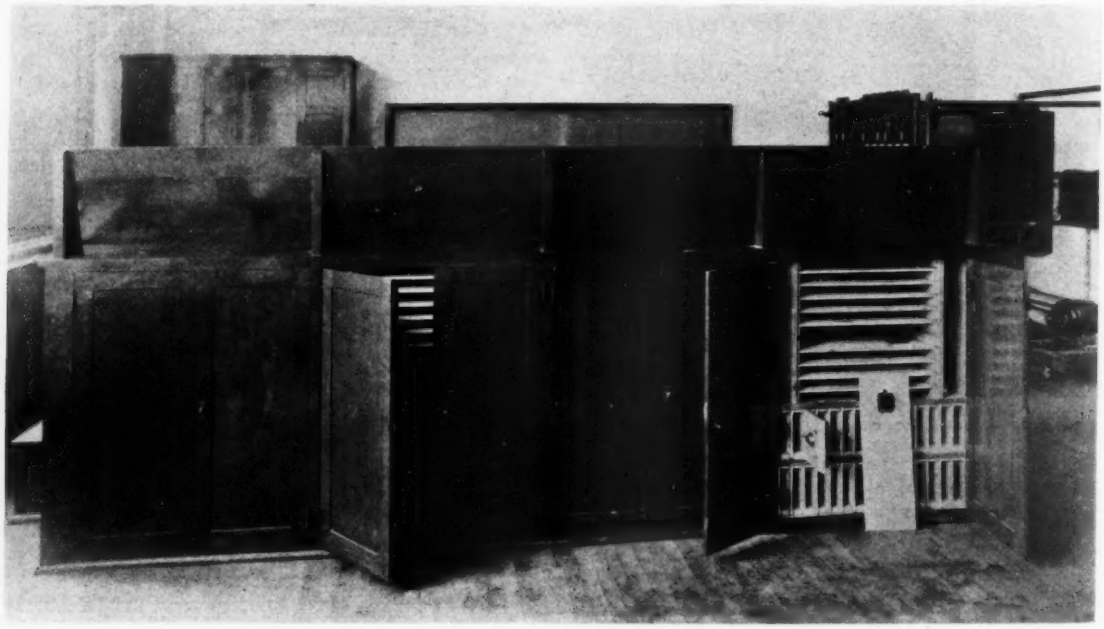
(See Page 82)

ROOM SHOWING BENCH TOOL CABINET AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS, MINN.

The Bench Tool Cabinet at the rear right of the picture contains 32 tool boxes. Each box contains the following tools: Jack plane, block plane, try square, marking gauge, knife, 12″ rule, screwdriver, 1″ chisel, back saw, and whisk broom. (See page 85.)

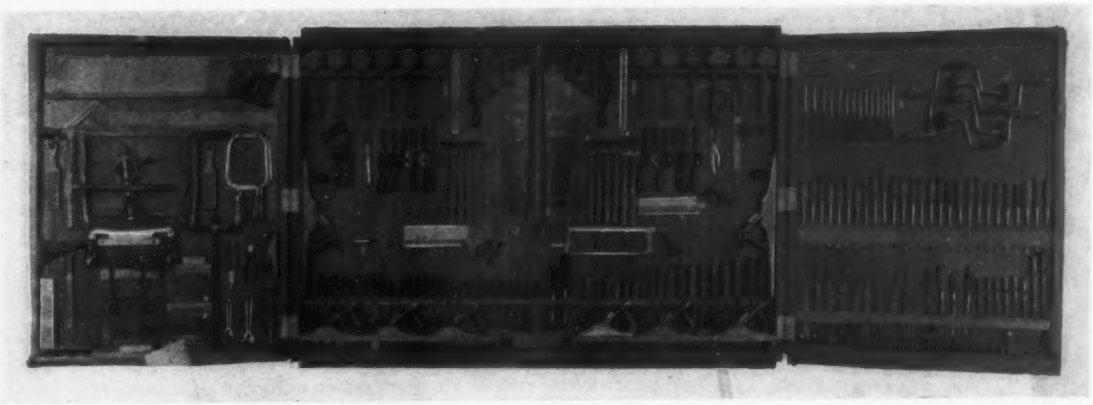
When a class enters the shop either the teacher or his deputy opens this cabinet and the boys file by, each taking the box belonging to his bench and places it on the rack under his bench. The cabinet is then closed and locked.

At the close of the lesson period the teacher or his deputy again opens the cabinet and as the boys file by returning their boxes to the cabinet, each box is inspected. If any tool is missing or anything is out of order the boy must fall out, put things in order and come up once more at the rear of the line. The line past, the cabinet is again closed and locked. This is all done in much less time than it takes to tell it and affords an absolute check on the tools. None are lost and responsibility for breakage or misuse is easily placed.



REAR VIEW OF RECITATION SEATS IN THE ELECTRIC SHOP AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL.

The picture illustrates how space under the raised portion is utilized for storage of wiring panels.
By hinging the front seat so that it may be raised a convenient space is provided for storing long pieces of conduit and similar supplies.

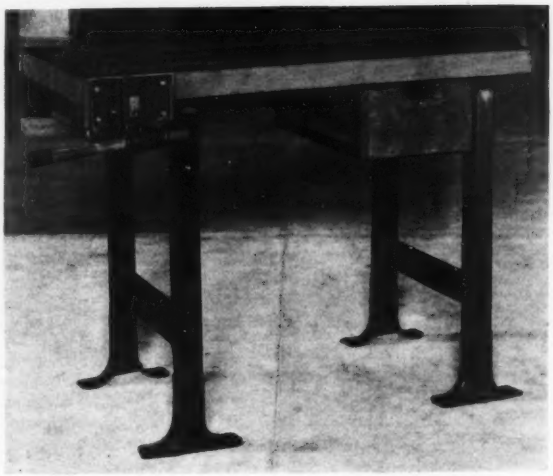


GENERAL TOOL CABINET FOR WOOD SHOP AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS, MINN.

This cabinet measures 4′ 00″ x 12′ 00″ when open and 4′ 00″ x 6′ 00″ when closed.

On the front of one of the doors is a numbered list, under glass, of all the tools and the space for each tool in the cabinet is numbered correspondingly. The systematic arrangement makes checking at the close of each session very easy and the numbered list helps in teaching the boys to apply the correct name to each tool.

Since adopting this method of handling our tools, our losses have been almost negligible. If, however, a tool should be broken or worn out, or if it should disappear for any reason, it is immediately replaced and charged against the budget of the school. The equipment is thus kept up to standard and the laborious and unsatisfactory process of making inventories at the end of the year is eliminated. The running account with each school also affords an easy means of comparing schools with reference to care of equipment.



STANDARD WOODWORKING BENCH.

This bench has a steel frame and a maple top, and is fitted with a rapid acting vise. See the inside of the tool drawer in the illustrations below.

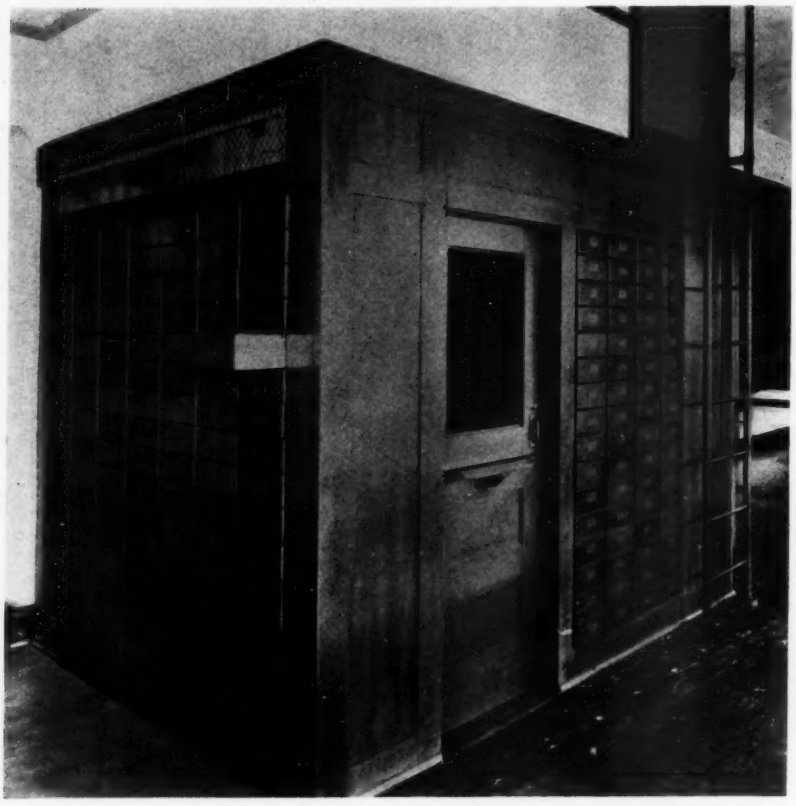
STANDARD KIT OF BENCH TOOLS.

Each bench is equipped with a standard kit of tools, which are kept in a tool locker between class periods. The outfit permits of quick inspection and minimizes losses. Tools not in constant use are kept in the General Tool Cabinet (above).

STANDARD KIT OF WOOD TURNING TOOLS.

Six cutting tools, a wood rasp, inside and outside calipers, and a brush are provided for each lathe.

A CORNER IN THE ELECTRICAL SHOP AT THE WASHBURN JUNIOR-SENIOR HIGH SCHOOL, MINNEAPOLIS, MINN.
The wiring canopy, wiring walls, and the tool and material locker are illustrated in this picture. Small panels for bell wiring problems are shown in the background and on the benches. The front benches are intended for setting up and testing wiring panels; the rear benches are fitted with vises and serve for general work.



MATERIAL LOCKERS FOR JUNIOR HIGH SCHOOL ELECTRIC SHOPS, MINNEAPOLIS, MINN.

In shops of this kind it is necessary to have for each boy a safe place to keep the materials issued to him for any job or problem on which he may be working. We have met this requirement by building into the walls of the tool and supply room a battery of supply boxes which, when slipped into place are automatically locked and cannot be opened except from the inside of the tool room. When a boy wants his box he steps to the tool room door and announces his number. The boy inside trips the lock and pushes his box part way out so that he can get hold of it. The boxes are separated horizontally by sheet metal partitions so that when a box is out no one can get into the one below it.

The photograph shows 176 of these boxes all secured by the *one* lock on the tool room door.

TYPICAL MACHINE SHOP LAYOUTS FOR VOCATIONAL SCHOOLS

Howard S. Rowland

IT IS NOT difficult to find articles dealing with the functions and value of specific types and sizes of machine tools. The purpose of this article, however, is to give the impressions obtained from a survey made on a number of schools and colleges, with the hope that some of the suggestions may prove helpful to the readers of industrial arts. To obtain a good balance in the selection of machine tools is a very difficult thing—and to produce a layout which is at once economical of space and time, and yet complete to afford the best type of instruction is no easy task. Purposely, various sizes of schools, and consequently various sizes of machine shops, have been selected so that the reader may find suggestions which may prove helpful.

Training for Industry

Interviews with manufacturers throughout the country have revealed that industrial plants of today are more and more counting on the schools for the training of future shop mechanics and foremen, as well as executives. The apprentice systems which in years gone by were so universally in vogue, have since the war in many centers, decreased in activity. Opposed to this, of course, are trade schools which are operated by the industries themselves, but at large the medium-size plant has come to depend more and more upon the schools for its men. It is extremely important that manufacturers cooperate with the instructors in the school work and lend cooperation not only in the selection of the tools, but in the layout of the shops as well, and also in the training which the boys receive.

Training on the Right Tools

Modern methods require modern tools; the fundamentals of machine tool operation must be taught and equipment must be available to instruct the boys on the latest types of machining so that they will be familiar with this practice when they encounter these machines in industrial plants in their active work.

The last five years have brought decided changes in manufacturing shops; more automatic machines have been installed; the machines have better control; they are safer to operate; being stronger, they can take off more metal and do more work; and in addition, they are more accurate.

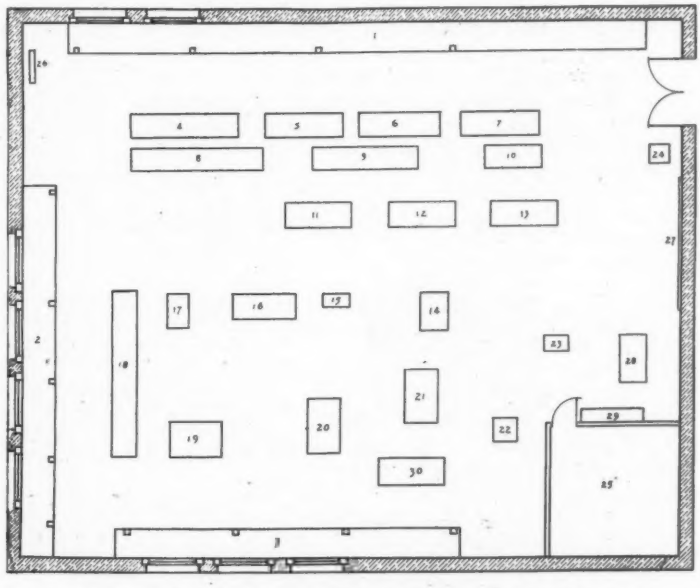
The boys must be equipped to get into the shops to handle and to understand this new type of equipment. Therefore, the present shop layouts of schools require specific attention. It is well to look over these shops to determine whether or not the equipment is modern and whether in all fairness to the boys who are being taught, and to the manufacturers who depend upon these boys in future years, new equipment should not be considered and installed.

Typical Shop Layouts

The Long Beach Polytechnic High School of Long Beach, California, has been selected as our first illustration. This is a good example of the way in which progressive schools and school executives keep in touch with the standard manufacturing fields. In the first place, the equipment is modern. Care has been taken to see that the tools installed are diversified; that is, there are not too many of any given type of tool. This statement holds true with the exception of the lathe, where it might be suggested that a few lathes could be omitted and there might be substituted instead a cylindrical grinder and a radial drill. The equipment is fairly well balanced so that the boys who complete their training in this shop may be assured of thorough instruction. The equipment consists of the following:

Nos. 1-2-3—Workbench.
No. 4—15″ x 8 Greaves & Klusman Engine Lathe.
No. 5—14″ x 6 W. P. Davis Engine Lathe.
No. 6—14″ x 6 Fay & Scott Engine Lathe.
No. 7—12″ x 6 W. P. Davis Engine Lathe.
No. 8—19″ x 10 La Blonde Heavy Duty Engine Lathe.
No. 9—16″ x 8 Walcott Engine Lathe.
Nos. 10 and 30—Seneca Falls Engine Lathe.
Nos. 11, 12, 13—15″ x 5 South Bend Engine Lathe.
No. 14—Racine Power Hack Saw.
No. 15—Albany Sensitive Drill Press.
No. 16—16″ Drill Press.
No. 17—Arbor Press.
No. 18—24″ x 24″ x 8′ Cincinnati Planer.
No. 19—No. 1½ Cincinnati Milling Machine.
No. 20—16″ American Shaper.
No. 21—12″ Steptoe Shaper.
No. 22—No. 1½ Universal Cutter Grinder.
No. 23—Emery Grinder.
No. 24—Steward Gas Furnace No. 38.
No. 25—Toolroom.
No. 26—Power Switchboard.
No. 27—Blackboard.
No. 28—Teacher's Desk.
No. 29—Blackboard.

The suggestion is made that a heavy-duty milling machine, or at least a No. 2-M Universal milling machine, might be used to advantage in view of the fact that the one on hand is of older and obsolescent design. Furthermore, a forge

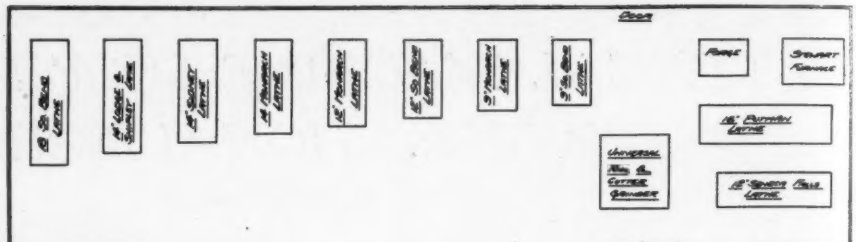


MACHINE SHOP AT THE LONG BEACH POLYTECHNIC HIGH SCHOOL, LONG BEACH, CALIF.

could be installed in the school to facilitate the handling of a greater variety of parts, making it possible to produce work which is practical and more useful than that turned out at the present time. Adequate space is available for the machines and an abundance of light is provided. The teacher's desk is located at a proper point where the instructor can obtain a full view of all the boys at work and be ready to give assistance to any who may require it.

Our second illustration is likewise on the Pacific coast, this one being taken from the John Muir Technical High School at Pasadena, California, where Mr. E. A. Cropp, the instructor, has given a considerable amount of time and thought to the layout of his shop. The shop is typical of one of the smaller size schools, and while not large, the equipment has been exceptionally well selected. For instance, there are various sizes and types of lathes, but the lathes have been selected from different manufacturers in order to give the boys a thorough training. In this shop will be found a forge and a Stewart furnace, increasing the general effectiveness of the metal work. It is rather unusual in a school shop to find a planer, but here we have a 24"x24"x8' planer. In order to contrast the work done by the milling machine and shaper, these two machine tools are placed side by side and each one represents the latest design of its particular size and type of machine. The instructor's desk is located again at the end of the shop where he can obtain a full view of the entire shop. Our only suggestion in this layout is that a universal cylindrical grinder should be included with the rest of the equipment.

Coming now to a larger school, we find in the William L. Dickinson High School of Jersey City, some interesting features. The equipment, of course, is more expensive and perhaps a little more complete, than that shown in either of the two foregoing cases. Illustration 3-A shows that the lathes have been arranged for overhead line-shaft drive, but on a number of tools individual drive is used. The modern trend in machine tool design, particularly in that of lathes, is to have the self-contained motor drive with the motor mounted under the head, or in the base or bed of the machine.



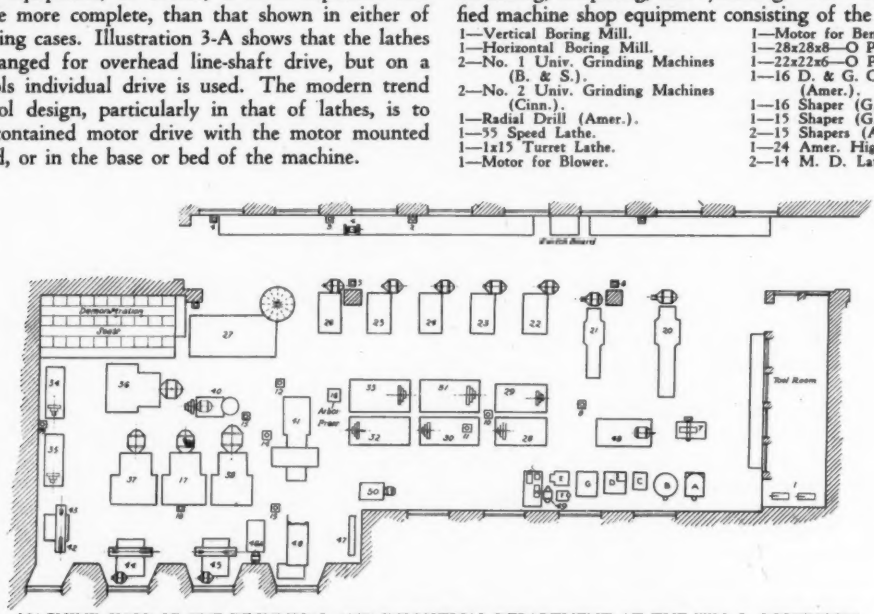
MACHINE SHOP PLAN AT THE JOHN MUIR TECHNICAL HIGH SCHOOL, PASADENA, CALIF.

In the upper left-hand corner of the illustration, are shown a series of seats, used by students when the instructors give lectures on specific machines or work. This is done right in the shop where the machines can be viewed with ease. Some schools follow the practice of mounting machines used for demonstrating purposes on wheels. These machines are rolled around from one lecture room to the other, so that when instruction is given the boys have the actual machine before them and this decidedly increases the effectiveness of the instruction.

The first layout shows a good arrangement for space and equipment, and in this particular room are found drill presses, wet tool grinders, taper attachments, and centering machines.

Illustration 3-B taken from another portion of the shop of the William L. Dickinson High School, shows the major portion of the machine tools. Particular attention is called to the good furnace equipment provided for hardening, case hardening, tempering, and cyaniding. Here we have a diversified machine shop equipment consisting of the following tools:

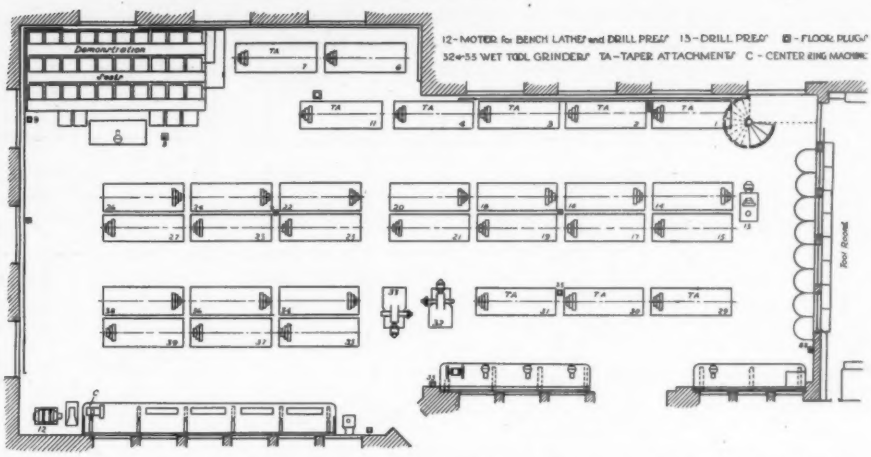
1—Vertical Boring Mill.
1—Horizontal Boring Mill.
2—No. 1 Univ. Grinding Machines (B. & S.).
2—No. 2 Univ. Grinding Machines (Cinn.).
1—Radial Drill (Amer.).
1—55 Speed Lathe.
1—1x15 Turret Lathe.
1—Motor for Blower.
1—Motor for Bench Lathes and Drill
1—28x28x8—O Planer.
1—22x22x6—O Planer.
1—16 D. & G. Crank Shaper (Amer.).
1—16 Shaper (G. & E.).
1—15 Shaper (G. & E.).
2—15 Shapers (Amer.).
1—24 Amer. High Duty Lathe.
2—14 M. D. Lathes.



MACHINE SHOP OF THE TECHNICAL AND INDUSTRIAL DEPARTMENT AT THE WM. L. DICKINSON HIGH SCHOOL, JERSEY CITY, N. J.

2—Whitcomb-Blaisdell Lathes.
2—16 Amer. High Duty Lathes.
2—Headey Norton Lathes.
2—1½-A Univ. Milling Machines.
2—2-A Univ. Milling Machines.
1—Drill Press.

It will be seen that motor drives have been used for the majority of tools in this shop, thus keeping in touch with the modern trend in the drive of tools. Demonstration seats are to be found in this shop in the upper left-hand corner and the same principle of teaching the boys in the shop is employed. It is suggested that a larger milling machine might be used to advantage, that another cylindrical grinder could be installed, and that some of the machine tools now used be replaced by similar machines brought out by the same manufacturers, to replace the models used. While the shop is an excellent one in many respects, there are several obsolete model tools which should be, and could be profitably replaced.


12-MOTER for BENCH LATHES and DRILL PRESS 15-DRILL PRESS
32-55 WET TOOL GRINDERS TA-TAPER ATTACHMENTS C-CENTER RING MACHINE
Demonstration
Seats
Roof Hoods

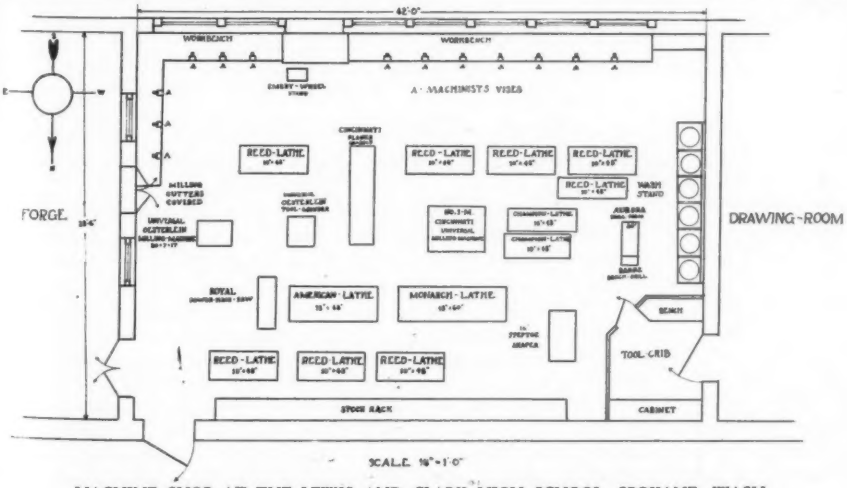
MACHINE SHOP OF THE TECHNICAL AND INDUSTRIAL DEPARTMENT AT THE WM. L. DICKINSON HIGH SCHOOL, JERSEY CITY, N. J.

At Spokane, Washington, the Lewis and Clark High School machine shop has been selected because of its excellent layout and diversification of tools. It will be noted that the machines are grouped in the center of the shop, leaving plenty of room for the side walls to be used for workbenches. Storage racks have received careful consideration—for instance, there is a particular rack for milling cutters; there is a tool crib, exactly similar to that found in a modern shop. This particular shop is an excellent example of a layout of a small toolroom in any good manufacturing plant and shows that care has been taken by the instructors to see that the equipment has been properly selected and carefully installed. Most of the machines are self-contained motor drive, but a few have the overhead type of drive. Over at the left, a special room has been devoted to the forge shop, which again emphasizes the initiative on the part of this school and the thoroughness with which the machine shop equipment has been selected.

The drawing room is at the right-hand side so that the boys have ready access to the machine shop. If any particular parts have been prepared on the drafting board for manufacture in the machine shop, careful attention can be given and a close tie-up effected between the drawing of the part and the construction of it in the machine shop.

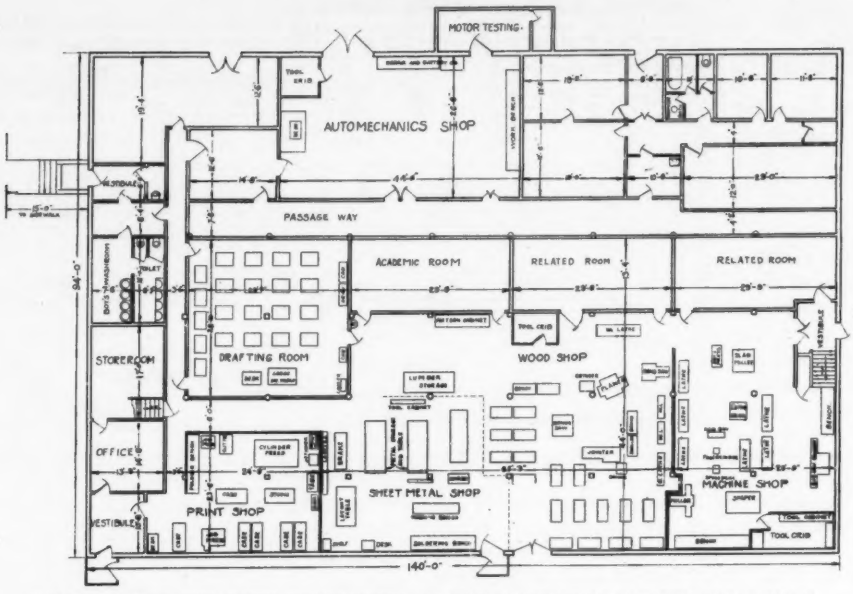
From Manitowoc, Wisconsin, we have our fifth shop. This is perhaps the most complete of any reviewed and it will pay to give thought and study to the layout and general arrangement not only of the particular machine shop but also of the other shops affiliated in this school's scheme of education. First looking at the machine shop in the lower right-hand corner, we are struck with the fact that the equipment is for the most part of modern design. There is a thoroughly well-maintained balance in the selection of the tools. While the number of tools is not large, the striking thing about the shops is that the right sort of tools have been selected to give the greatest value in the space available and for the money available. The quantity of six lathes is a little unbalanced and one of these lathes might have been replaced by a second milling machine, or at some time later for a milling machine of an up-to-date design.

Adjoining the machine shop is a related room to which the students go for any particular instruction which the teacher wishes to present to them. This holds true for all of the shops in the layout. The wood shop is particularly interesting, and again we have an excellent selection of equipment. The print shop is rather complete; the drafting room is so located that the students have access to the sheet metal shop, the wood shop, and the machine shop, as well as the print shop. It might be suggested that a small hardening equipment or foundry, with a small cupola furnace, could be installed to round out the equipment. The boys can make the patterns. In a foundry or hardening room, with the proper equipment, the pupils could make their own castings for the machine shop work.



MACHINE SHOP AT THE LEWIS AND CLARK HIGH SCHOOL, SPOKANE, WASH.

In the San Pedro High School, San Pedro, California, we come again to one of the smaller schools, yet one which has selected a representative line of machine tools. There is plenty of room and a representative lot of machine tools. The feature of this layout, however, is the classroom in the lower right-hand corner where there are seats for twenty pupils. A special



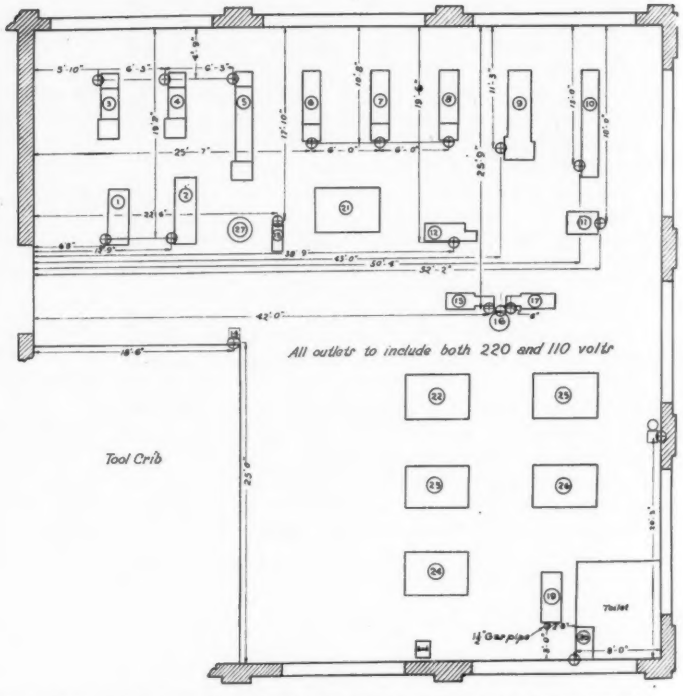
FLOOR PLAN OF THE BOYS' DEPARTMENT AT THE MANITOWOC VOCATIONAL SCHOOL, MANITOWOC, WIS.

rack is provided where the boys have access to the latest magazines and trade journals. A special cabinet has been provided for the storing of blue prints.

Our criticism of this layout is that there are too many lathes, most of them being of the same size. A larger variety of lathes of the same number would have improved this shop, or perhaps a fewer number of lathes and the use of this money for the installation of a cylindrical grinder would have been more profitable.

Our last illustration is from the John C. Fremont High School. Here we have all of the machines of a self-contained motor drive. There are, perhaps, too many lathes for this size shop and another large milling machine could very well replace one or two of the lathes now used. There is an opportunity for the installation of a cylindrical grinder and also for forge or heat-treating equipment. A list of the equipment used in this school follows:

No. 1—Monarch 12" x 5" Lathe.
No. 2—Monarch 14" x 6" Lathe.
No. 3—Sidney 14" x 6" Lathe.
No. 4—Sidney 14" x 6" Lathe.
No. 5—Sidney 14" x 10" Lathe.
No. 6—Rockford 14" x 6" Lathe.
No. 7—Rockford 14" x 6" Lathe.
No. 8—Rockford 14" x 6" Lathe.
No. 9—Lodge & Shipley Lathe.
No. 10—South Bend Lathe.
No. 11—Rockford No. 1½ Miller.
No. 12—Whip Shaper.
No. 13—Peerless Power Saw.
No. 14—U. S. Floor Grinder ½ h. p.
No. 15—Cincinnati Drill Press.
No. 16—Washburn Drill Press.
No. 17—Excelsior Drill Press.
No. 18—U. S. Floor Grinder 1 h. p.
No. 19—Stewart Furnace.
No. 20—Blower.
No. 21—Bench.
Nos. 22, 23, 24, 25, 26—Bench.
No. 27—Barnes Arbor Press.

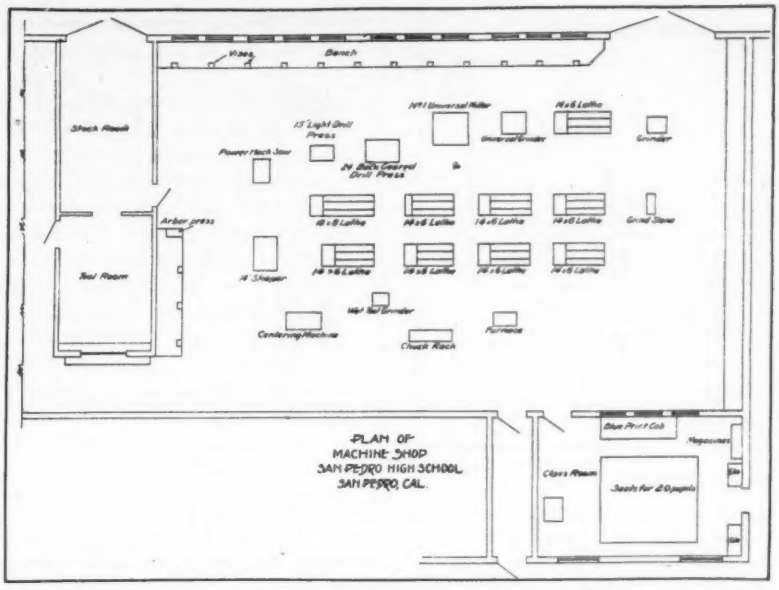


FLOOR PLAN OF THE MACHINE SHOP AT THE J. C. FREMONT HIGH SCHOOL, FREMONT, CALIF.

Looking Ahead

It has been hoped that some of the ideas which have been presented in this article will be helpful to the reader. Manufacturers of machine tools willingly offer suggestions, make layouts, or suggest modern equipment. Visits to other schools, and to industrial plants, are recommended before a machine shop is equipped; or, if an old machine shop is to be reequipped, by all means consult the local manufacturers or those in near-by cities, as well as members of the board of education and others who are interested in the installation, so that tools which are really going to give the greatest possible returns from the investment are put in.

It is predicted that the next three years will see decided changes in the attitude of those responsible for the installation of mechanical equipment in schools and there will be a more sympathetic attitude toward the installation of modern equipment. It is possible that this new equipment will be more expensive than that heretofore installed, for many schools have found that the cheapest machine, while perhaps affording the fundamentals for certain types of instruction, are decidedly lacking when it comes down to a practical application



FLOOR PLAN LAYOUT OF THE MACHINE SHOP AT THE SAN PEDRO HIGH SCHOOL, SAN PEDRO, CALIF.

of these tools in industry. Consequently, many manufacturers are insisting that their local schools install real working models, or in fact real working duplicates of the equipment they use in their own plants. This gives the boys a real background and an opportunity for a thorough knowledge of the productivity and usefulness of these tools.

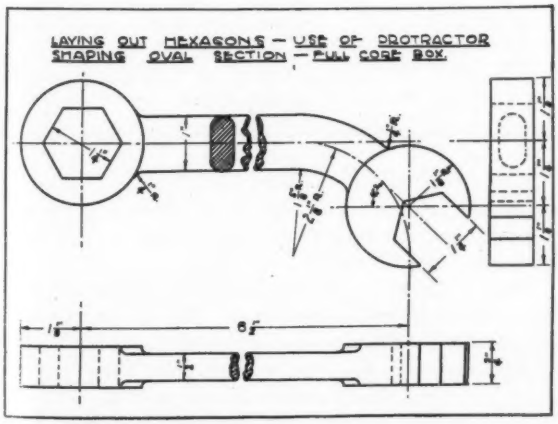
A COURSE IN PATTERN MAKING

C. W. Illingworth, Instructor of Pattern Making, Vocational School, Racine, Wisconsin

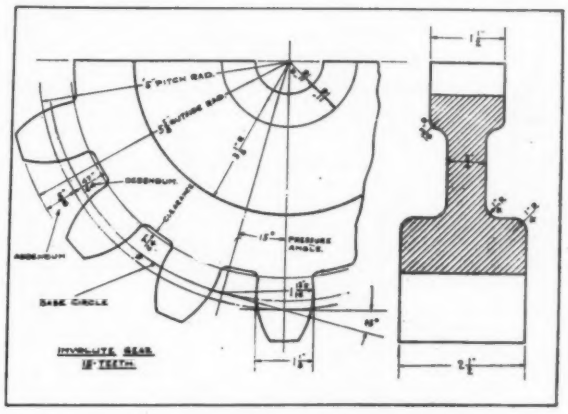
(Conclusion)

A record is kept of each job completed by the student. On this sheet are printed the names of the jobs and divisions into units. When a job is completed the grade is entered. The grade takes into consideration quality of work, attitude toward work, and speed.

Upon completion of a unit, a checkup is made to ascertain if the material covered is thoroughly understood. To take care of this the student is given a written test. The grade of the test is entered on the job record sheet and an average for the unit is then made. The records are kept in a looseleaf binder for ready reference. From these records it is always possible to assign work even though a boy has been absent for some time. It is always known just what he has accomplished, and it is possible to show parents, employers, and others, the boy's advancement. When a boy leaves the class, drops out of school, or enters another class, his record is placed in a similar loose-leaf binder. If he returns to the class, his record is then taken from the "dead" file to the active file, and he is able to continue his work where he left off with no confusion in getting started.

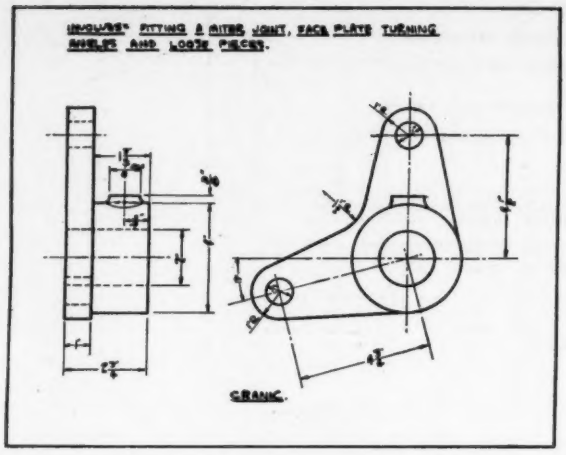


TYPICAL PATTERN PROBLEM (UNIT III).

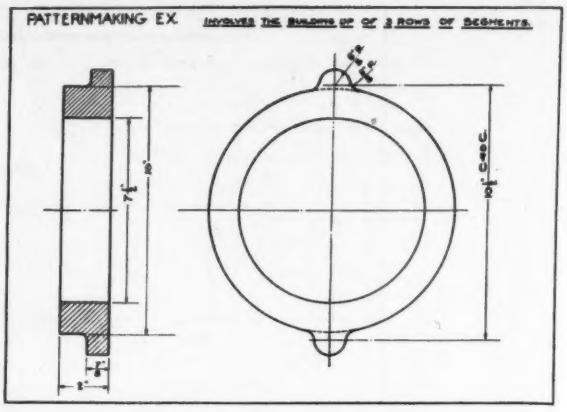


A GEAR PROBLEM (UNIT VIII).

In order that the student may be able to intelligently make each pattern and know just how it is to be used, he must be supplied with a great deal of technical information. Much



A PATTERN PROBLEM IN UNIT IV.



PROBLEM FOR UNIT V.

of this must come through individual coaching. However, it is often desirable to give a class demonstration or a shop talk. The chief difficulty is that each student is in a class by himself; some are beginners and others are advanced students of varying degrees. To overcome this, I have selected eighty demonstrations or shop talks, ten for each unit, or one for each week. They are the high lights around which are built the many points given individually. They are directly applicable and necessary for a full understanding of the jobs in that unit. From an understanding of these points the student is able to use his own initiative—a vital point in patternmaking in constructing patterns in the particular unit.

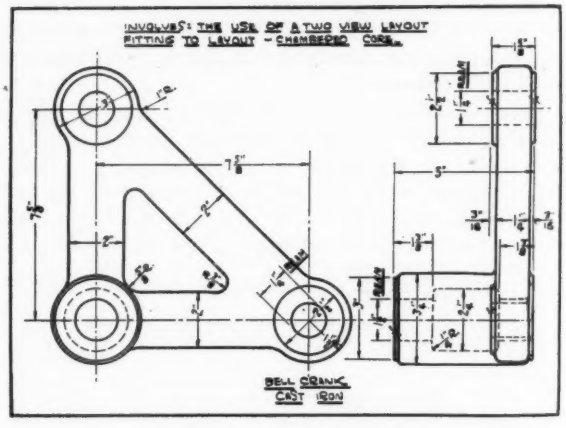
Much of this knowledge is also used in the following units. These talks are worked into printed form with numerous pictures and sketches. Each day a time is set aside for class discussion. The class is divided into groups, perhaps three or four groups or even more. Often it becomes advisable to have the class discussion just when some particular point has arisen, and each group is given the technical information sheets suitable for that day's lesson. I begin first with one group and then with another and briefly explain the subject, sometimes by blackboard sketches, and again by demonstrations, while the other groups are continuing their study of the printed matter. In this manner I am able to cover a greater number of subjects in a given period of time and each boy obtains something new and necessary at the time. The progress of the pupil is not hindered by listening to something too elementary or too advanced for him. The lesson sheets for one unit are fastened together, forming a booklet.

The main points of this material are covered in the test paper and serve as a check. If the grade of the test is low the pupil must review. Sometimes it is evident, from the manner in which the pupil works at the bench, that part of the information was not entirely clear and here a little individual coaching will help.

PATTERN MAKING
RACINE CONTINUATION SCHOOL

NAME _____ DATE ENTERED _____ 192

UNIT PERFORMANCE RECORD FORM.



BELL CRANK PROBLEM IN UNIT VI.

That I may know just what lessons the student has had, I keep a technical information record. This is in a loose-leaf binder and is handled the same as the job record, that is, in making a shift from the active to the dead file, and vice versa. There is a record sheet for each unit for each boy with the subjects listed and space for the date which is entered when the lesson sheet is given out. The exact order in which the

subjects are listed is not always followed. It is often well that the boy be given a lesson which will fit three or four other boys.

By the use of this record no boy will miss a lesson because he was absent. What he has had, and what he needs, are always easy to find out. Spaces on his record not stamped indicate that he has not been given those particular lessons.

Each boy has a notebook in which are kept the technical information sheets he has had and a blue print of each job completed. This serves as a ready reference and may be taken home at the end of each ten weeks. It shows to his parents and others interested in the progress of the pupil in school.

The time consumed in keeping the records is remarkably small and is well worth the effort, since it eliminates confusion and guesswork in seeking to serve the boy. When a new boy comes into the class, or a former student returns, everything is ready for him. There is a minimum of delay in getting him started and when that start is made he is not working on something just to keep him busy but is beginning a link in a chain of definitely planned work which aids him in reaching the goal in the shortest time.

1571 RACINE CONTINUATION SCHOOL
PATTERNMAKING
Test—Unit 1

Name.....
Date.....

1. What are patterns for?
2. What is draft and why must patterns have draft?
3. What are calipers used for in turning?
   What is the gouge used for in turning?
4. When do you put in wax fillets?
   Why are they put in?
5. How are dimensions shown from one point to another on a drawing?
   What is meant by a cross section?
6. What shrinkage rule is used for small gray-iron castings?
7. What is the gauge used for?
   What are dividers used for?
8. Name the two parts of a flask.
   Through what holes does the metal run to get into the mold?
9. What kind of glue is used in patternmaking?
   Describe how you would go about gluing two pieces of stock together.
10. Give the first five operations in making any pattern.

1665 RACINE CONTINUATION SCHOOL
PATTERNMAKING
TECHNICAL INFORMATION RECORD

Unit III Name.....
Key Date

A Finish marks .....
  Amounts to allow.....
  Figuring finish sizes on round pieces.....
B The layout board.....
  Draft allowances .....
C The protractor .....
  Study of angles .....
D Laying out the hexagon.....
  Making a hexagon-shaped core box.....
E Use of pinch dogs.....
  Use of corrugated fasteners.....
F Truing a board.....
G The vertical core.....
  Tapered core prints.....
H The irregular parting.....
I The brass and aluminum shrink rules.....
J The green sand core.....

Patternmaking

THE LAYOUT BOARD

USE—On the layout board is drawn the patternmaker's full-size knife and gauge line drawing of the pattern. This layout is made with a shrinkage rule and has the core prints, shape of the core boxes, and very often the draft laid out.

Sections of patterns are often put together on the layout board, the pieces being set and fitted to the lines.

KINDS—A layout board may be as small as 12″ x 6″ and up to a very large one 15′ or 20′ long.

PREPARATION FOR USE—All boards must be planed until they are true and straight. One edge should be planed straight and square.

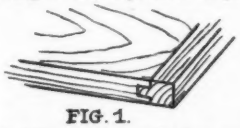


FIG. 1.

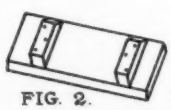


FIG. 2.

Boards 15″ or wider usually have some means of keeping them straight. This is done either by putting a tongued piece on each end, Fig. 1, or by screwing cleats on the back, Fig. 2. No glue should be put on the cleats as the board would then warp.

Very large layout boards are fastened down to 2 or 3 saw horses so that the whole resembles a table. Fig. 3.

APPLICATION—1. After the board has been trued up, the first thing to do is draw a horizontal center line or starting point parallel with the edge. This is done with the gauge.

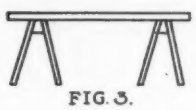


FIG. 3.

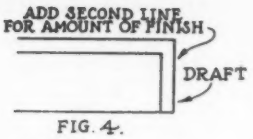


FIG. 4.

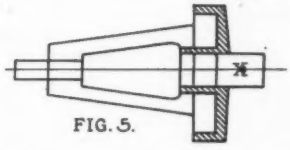


FIG. 5.

2. Draw a vertical center line or starting point with the square and a sharp pointed knife. You are then ready to proceed with the actual layout.
3. Lay out the job full size with the proper shrinkage rule without adding finish or core prints at this time.
4. Wherever it calls for finish, add another line 1/8″ from the given point. Fig. 4. If the draft is considerable, lay that out, too.
5. Lay out core prints to proper length and size or diameter.
6. Pencil in the outline of the pattern, core prints and shape of the core with a chisel point pencil. It is not advisable to do very much penciling until the general outline is completed.
7. Chalk or black in with a pencil the amount of finish added, Fig. 4. Do not let this chalked space extend through the shape of the core as at x, Fig. 5.
8. All lines are full, none dotted. Crosshatching or shading should not be put on layout boards.

CHAPLETS

Purpose—Where it is not possible to properly support a core with core prints, chaplets are used. Often a core will fall or overbalance if there is no support. Again, a core may rise or float up because it is not properly held down. Chaplets placed in the mold and on the core will prevent this.

Kind—Chaplets are made of thin white metal which melts easily. Some look like spools, others are perforated pieces of metal bent into a hollow square. They come in different sizes to match different thicknesses of metal.

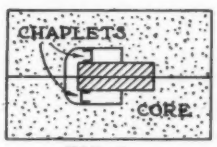


FIG. 1.

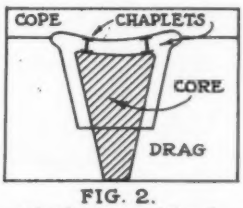


FIG. 2.

Application—In placing chaplets in a mold, where an overbalanced core is used, the pattern is drawn out, a chaplet placed in the drag, the core set in place resting on the chaplet and then another chaplet placed on top of the core. The core is then closed over and it will touch the upper chaplet. See Fig. 1. The chaplets are the same size as the metal thickness.

Another type of job is shown in Fig. 2. Here chaplets are in the cope only and serve to hold the core down so it will not float up.

When the hot metal runs in, it gradually softens the chaplet which then becomes fused with the iron.

The objection to the chaplets is that they do not always fuse in properly and may cause a leak where it is desired that the casting hold water.

MASTER PATTERNS

When a great many castings are to be made, a metal pattern is used. This metal pattern may be made of brass, aluminum, or iron.

To get the metal pattern, it is first necessary to make a wooden pattern which is called a master pattern. A brass, aluminum, or iron casting is made from the master pattern and is then filed and machined to the correct dimensions given on the drawing for the pattern.

In making the master pattern, it is necessary to allow for double shrinkage. Take for example a brass pattern which is to be used to make iron castings.

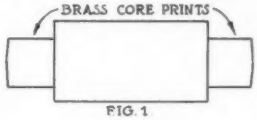


FIG. 1

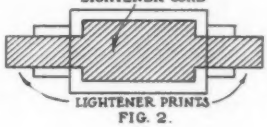


FIG. 2.

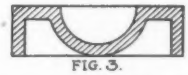


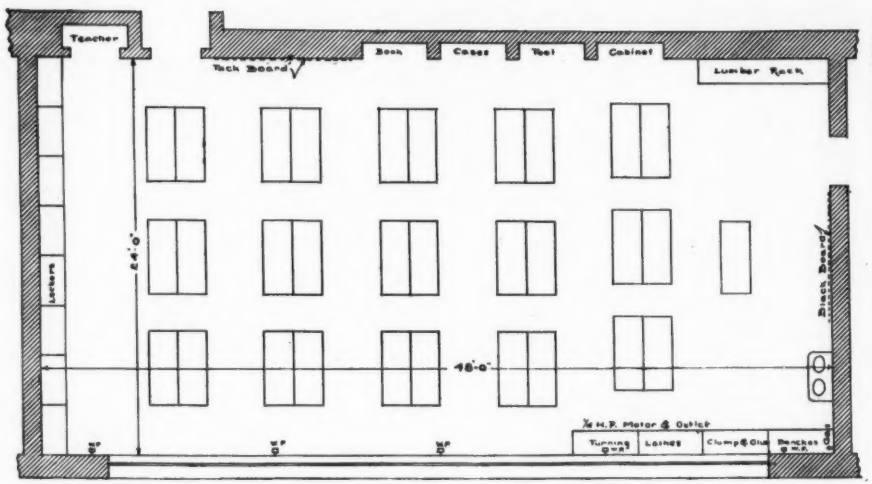
FIG. 3.

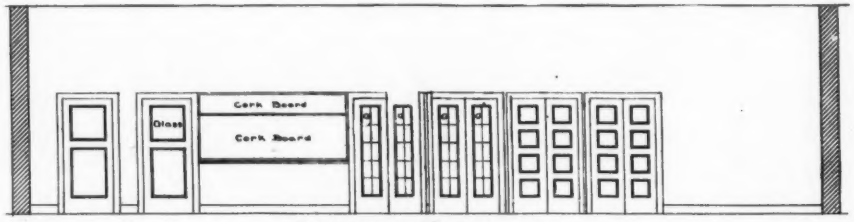
The brass for the metal pattern will shrink 1/16″ per foot in casting. Then the iron castings made from the brass pattern will shrink 1/8″ per foot. Therefore, the master pattern should be made with a 1/16″ shrinkage rule (1/8″ + 1/16″ = 3/16″).

The metal pattern must be made as light as possible. If cast as a solid piece of brass, it would be quite heavy. It must, therefore, be cored out. Take for example a bushing pattern: Fig. 1 shows a bushing with core prints. These core prints must be cast on the pattern proper and also machined. Fig. 2 shows a master pattern for making the brass pattern. It has lightener core prints with a chambered core which will lighten out both brass pattern and brass prints. A rough core box should be made as per the cross sectioning to make the lightener core.

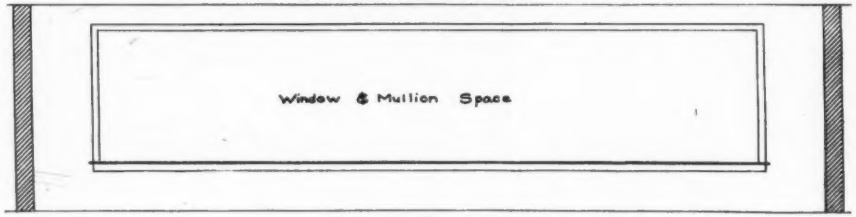
The metal core box should also be lightened. Fig. 3 shows a box for a half-round core. It is carved out at the back with supporting legs running the full length of the box so it will rest level on a bench. The thickness of metal allowed for a core box is usually 1/16″ or 1/4″.

Typical Shop Layouts in the New High Schools at Denver, Colo.



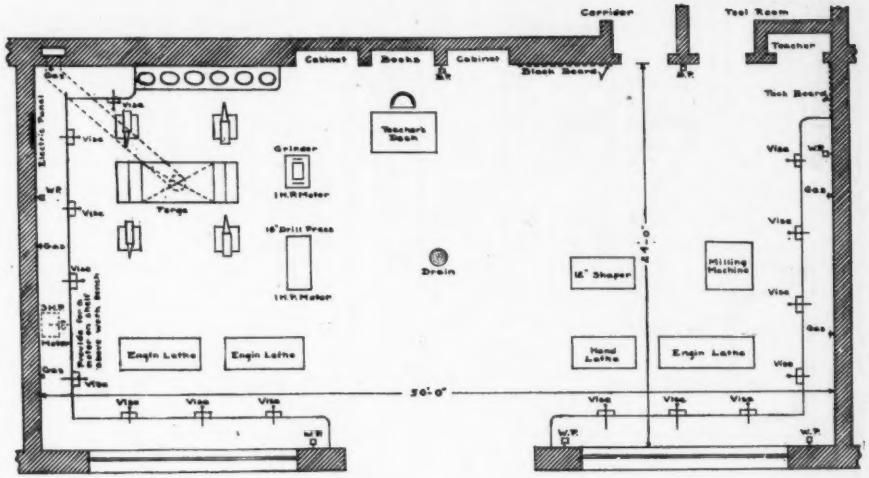


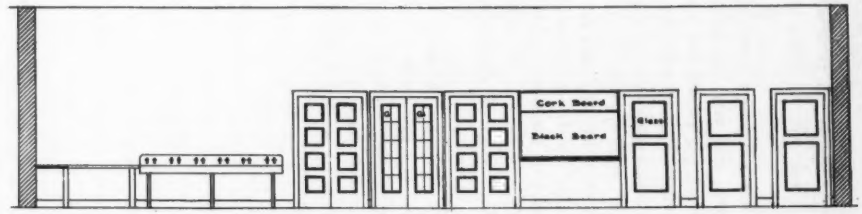
CORRIDOR ELEVATION



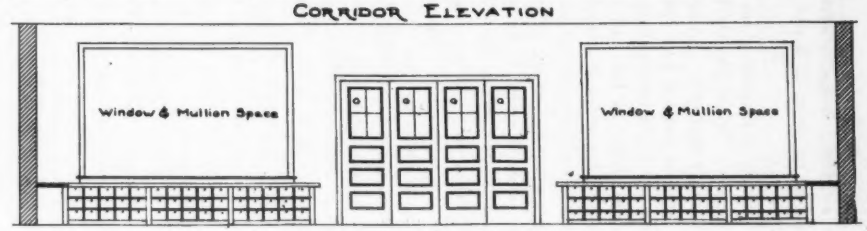
WINDOW ELEVATION

TYPICAL WOODWORK SHOP IN THE DENVER HIGH SCHOOLS.





CORRIDOR ELEVATION

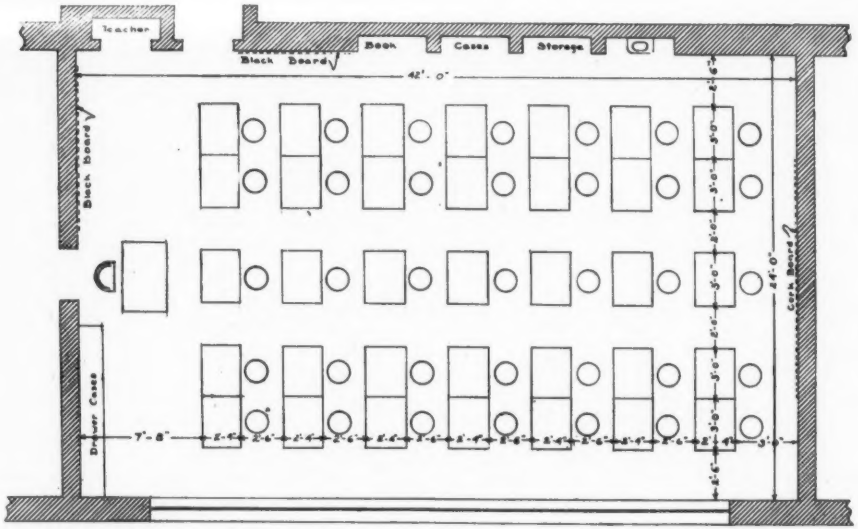


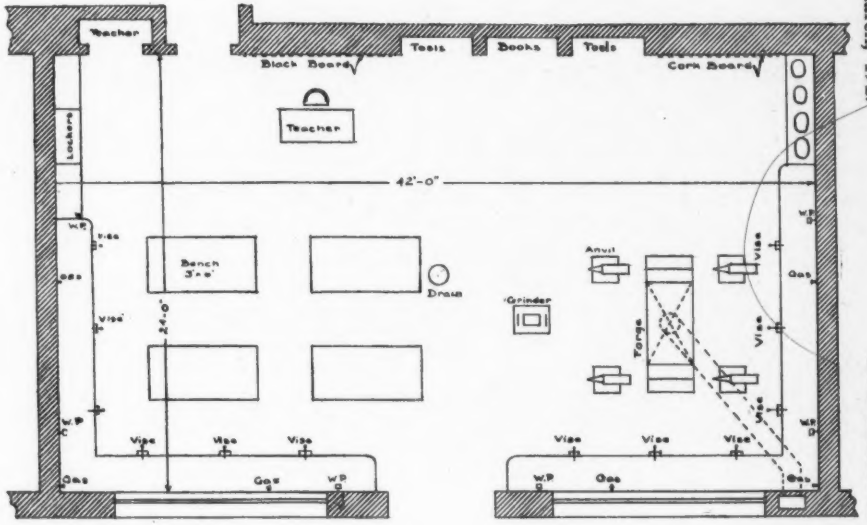
WINDOW ELEVATION

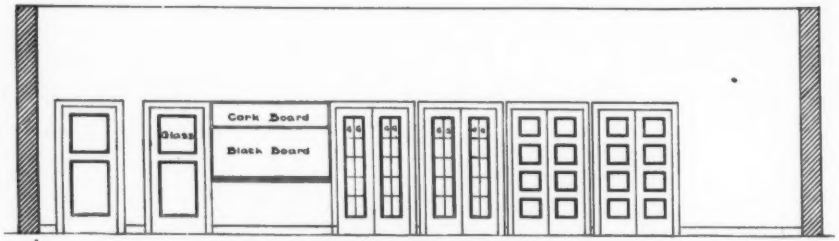
TYPICAL AUTO SHOP IN THE DENVER SENIOR HIGH SCHOOLS.

TYPICAL WOODWORK SHOP IN THE DENVER HIGH SCHOOLS.

TYPICAL AUTO SHOP IN THE DENVER SENIOR HIGH SCHOOLS.







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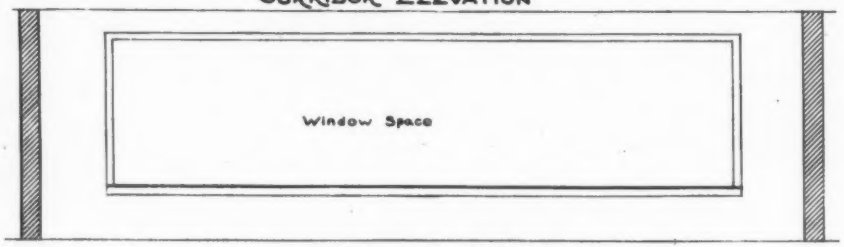
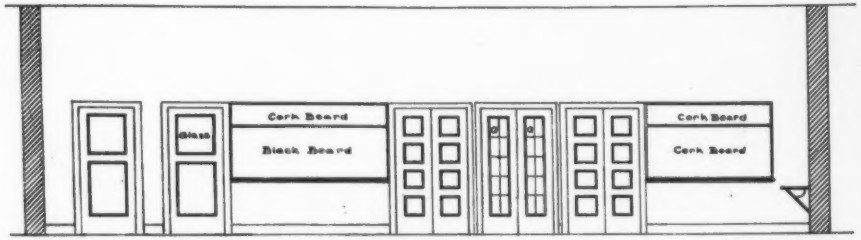


WINDOW ELEVATION

TYPICAL MECHANICAL DRAWING ROOM IN THE DENVER HIGH SCHOOLS.



CORRIDOR ELEVATION

WINDOW ELEVATION

TYPICAL SHEET METAL SHOP IN THE DENVER HIGH SCHOOLS.

INDUSTRIAL-ARTS MAGAZINE

E. J. Lake S. J. Vaughn

Editors

THE LURE OF THE DIFFICULT AND THE IMPOSSIBLE

There are so many changes going on in our industrial, economic, and social life and institutions that it is difficult to tell from one year to the next just what emphasis to place on any phase of instruction. While truth remains the same, the avenues to truth are many and varied, and are constantly multiplying and changing.

Courses of study are the constant subject of investigation and readjustment. They are so in almost every particular subject like history, mathematics, and science.

When we come to the industrial field, the matter is seriously complicated by the various forms of life and livelihood, work, diversion, and profession in the different sections of the United States. One section has farming for its major occupation; another has mining; another textile manufacturing; another lumbering; another fishing; another cotton growing; another grazing and stock raising. One city has fire protection ordinances prohibiting the building of any sort of wooden structures. Another city has its peculiar and particular work and requirements; and still other cities have other species of differences.

Taking these things into consideration, along with the great number and variety of fields of employment, and the multiplicity of individual differences, aptitudes, likes, and needs, it is no small matter to decide what should constitute a course of study to be pursued by all or any considerable proportion of the boys and girls of this country. It is even difficult to determine what particular material is to be used in any shopwork course.

Certainly this much can be said: The first great thing to be accomplished with an individual is to develop his native powers, give him varied useful experiences, create in him the right attitude toward work, and make him as nearly a perfect individual as possible. The next thing, and one that must be accomplished in conjunction with the first, is to make him an efficient, thoughtful, responsible, and sympathetic member of the whole group of citizens. The problem is, of course, in the complicated and confused life of the time, to select such studies, problems, experiences, materials, and equipments as will minister to these great fundamental purposes of human education. Let no teacher think that he has solved his problem. The fascination of the teaching job is that it is never done, and its problems are really never solved. That's the way of life.

OBLIGATIONS INVOLVED IN FREE EDUCATION

There are certain aspects of public higher education that are rather disturbing to the thoughtful student of the present trend of affairs. The cost of such a system of education to the state, and to the individual taxpayer, is increasing at an amazingly rapid rate.

America is definitely and wisely committed to the principle of free public education, and it is so committed to the principle on the grounds of protection to the country and society and of safety to the general welfare. Only secondarily, incidentally, and indirectly do the development and the advancement of the individual concern the governmental purpose in education. That the government's ultimate purpose is achieved through the development and advancement of the individual does not alter this fact.

The free aspect of public education was conceived in the hope and ambition for universal education. As long as education was in the reach of the well-to-do only, there could be no hope of universal education because of the comparative poverty of a large percentage of the population. Hence, free public institutions were established with no charges for tuition, indeed, no charges whatsoever, except nominal amounts for matriculation, laboratory, and athletic fees.

The consequences are that a great influx of students has poured into these free institutions. Living in such centers has become precarious and expensive. The congestion, the social life, the fraternity and sorority, the athletic activities, and a multitude of other similar demands upon the paternal purse have forced the cost up to the level of the cost in the best private and endowed institutions in the land. Thus, the very purpose of the free institutions has to a considerable degree been defeated, and education in large measure still remains for those who can pay the price. While this is true, let it be repeated that the *cost is not for education,* but is quite largely for those things that not only do not aid and promote education, but in a large number of instances actually hamper, retard, and even prevent education.

The parent and the student do not have at all the same point of view of the purpose of the free public institutions that is held by the government and by those who established such institutions. Parents send their sons and daughters to the free public institutions in order solely to get all they can at public expense for their own private advantage.

There seems to be little evidence that students leave the free public institutions with any feeling of gratitude for the public bounty, or any well defined purpose to make proper returns in service and contribution to the general well-being, for the generosity of the community or state in providing educational facilities without cost.

Unless such a feeling of responsibility can be developed in the students of our free public institutions as will make them regard themselves as *guardians* of the public good and *stewards* of their influence, their services, and their fortunes for the welfare of all, then the great purpose of public higher education will have been tragically defeated.

The time may come when every student graduating from a free public institution may be held under obligation to that institution or to the state that maintains it, to the amount of the actual cost of his education, at least, until such time as his influence, his service and his achievements for the common good may be considered to have brought recompense to the state, equal to his educational bounty.

PLASTIC BUT NOT SOFT

The old time pedagogy prided itself on definite answers to definite questions. The modern pedagogy recognizes that truth may be compromised and understanding evaded by seemingly definite response.

The old time pedagogy was arbitrary in method and purpose. The new pedagogy is based on the belief that excellent opinion depends on understanding but is not often final.

Geography and history may be considered as school subjects that are informational, yet few teachers of these subjects would now be satisfied to give their pupils the old time examination limited to a series of verbatim questions and answers.

One successful school superintendent recently stated that for years he had permitted no direct examination in history

or geography but had insisted that grades in these subjects be based on reports of topics studied from references and discussed in class. Soft pedagogy, you say? No! The work done on a report of this sort is readily estimated. The reports are reviewed in class periods and any superficial interest may be detected. The ambitious pupil may do more than the required work on a subject but the dullard and the lazy pupils may be held to constant and definite study or at least be detected promptly if they do not.

One other phase of modern teaching is the insistence on personal and individual demonstration. The laboratory and the shop are essential to learning because one only learns well that which he experiences. Learning by hearsay is not effective because it is not applied to the individual. If education could be secured by the reading or hearing of opinion expressed by others, we would be highly educated indeed for there is no lack of the transmission of opinion. Even the established truth must be verified by the individual before it becomes vital.

Much of the old time reading and hearsay was soft pedagogy because it was only the repetition of trite statement without understanding. It was exceedingly easy for some to commit learned words by the yard and repeat them with facility, gusto, or grace at every opportunity. If a teacher knew her text nothing more could be asked of her. If a pupil knew the text a great scholar was in the making.

The industrial arts offer content which is readily adapted to educational purpose because it is adapted to educational processes and includes a variety of experiences essential to well-ordered life.

It is plastic but not soft; variable in content and interest, yet possible of demonstration easily evaluated.

The teaching of the industrial arts should be plastic but not soft.

MECHANICAL-DRAWING COURSES

The present tendency in the teaching of the so-called "mechanical-drawing" courses is to deviate from instrumental drawing and stress the subject as a language study. This movement has been slow to develop since it is easier for the instructor to assign a problem to be drawn, and then wait a few hours or days for the student to execute the drawing. In many places today this development is little felt, while in others it is frowned upon. The aggressive teacher, however, realizes that the student's welfare should receive first consideration and arranges his courses to be of maximum value to all of his students.

The movement toward more informational courses, in contrast to the development of instrumental skill, can best be noticed in magazine articles by teachers, and in publications which have appeared on the market during the past few years. It would appear that to many the tremendous loss of valuable time in devoting the major part of the allotted time to the use of instruments, is appreciated.

No longer is it true that to learn to read drawings, it is necessary to make drawings—nor is it true that by making a few instrumental machine drawings a boy may possibly make during a secondary school course, that he is equipped to enter industry capable of reading the shop drawings he will encounter.

From another angle, not all schools are aware that industrial-arts courses in this subject should cover various forms of drawing. The average class is a heterogeneous group, including the business men, professional men, mechanics, and laborers of the near future. This group of students will have use for "mechanical drawing" as an informational course in various fields. The lawyer, doctor, civil engineer, and machinist offer distinct problems, calling for special kinds of drawing. This condition can be met by a reading or sketching course which is more adapted to the future needs of all students than the courses as given in many schools today. To include only a short course in woodworking and machine parts will not solve the problem.

Yet, a visit to many junior high schools will reveal the drawing board and instruments, with perhaps boys busily copying a completed drawing. Yes, there is much opportunity for improvement, in spite of the forward-looking program which is evident in many places.

DEMOCRACY AGAIN

The strongest fundamental principle of all vocational education is its claim to democracy—the equality of opportunity for all the children of all of the people. Seldom do we listen to an address at a meeting of representatives in this field of education without hearing a reference to this principle.

It is gratifying to know that the leaders in this movement hold to this old truth and continually use it to impress industry, school administrators, and the public. No stronger argument can be used to show the justification of our courses in the curriculum.

The extent to which the average teacher cooperates in advancing this principle of democracy might be seriously questioned at times. It is not uncommon to find well-meaning teachers of trade and industrial-arts subjects arranging their courses of study to be adapted to the higher mentality of the class. It is in rare cases that an instructor will consciously accept the average boy when he is forced by cramped space, or lack of equipment, to accommodate a selected few. Selected few, too often, seems to indicate that the high I.Q. should be given the preference. This is the academic viewpoint and should be altered to fit into our scheme of democratic education.

Our duty is to care particularly for those who are apt to drop by the wayside and be compelled to seek employment. As Dr. Prosser reminds us, we need intelligent followship as well as intelligent leadership. Those of higher mentality make up the smaller group and eventually fit themselves into life's reality whether we give them little or much time. Those less generously endowed mentally will be handicapped tremendously without our assistance, and result in a drag upon society.

It is not the place of specialized trade training to care for those not mentally equipped to assume the responsibilities of tradesmen, but a well-rounded program of vocational education offers opportunities to all classes, commensurate with capacities, through flexibility and adaptability of courses of study. It reduces itself to a question of administration to live up to the principle of democratic education, allowing special training for all ages and classes. The teacher should be concerned with cooperating with administration in this cause and with keeping the ship on its proper course, through all legitimate means.

It is the old story of democracy in education over again, stressing the strongest support for our existence, but it cannot be emphasized too strongly, nor called to our attention too often.

Manual Arts on Upward Rise. A study recently completed by the United States Bureau of Education (Ind. Ed. Circular No. 26, 1926) indicates that manual arts work is on the increase, not decrease. The study which covered a ten-year period from 1915 to 1925 recorded returns from 307 cities, and of these, 221 cities showed an increase in time of from ten per cent to 100 per cent. Of the balance, or 86 cities, 58 had not increased their time allotment any, 11 had made an actual decrease, and 17 cities reported no manual arts work of any kind. Of the cities decreasing the time allotment, seven were from 5,000 to 10,000 population, three were from 10,000 to 20,000 population, and one from 20,000 to 50,000 population.

IN DEFENSE OF PRINTING

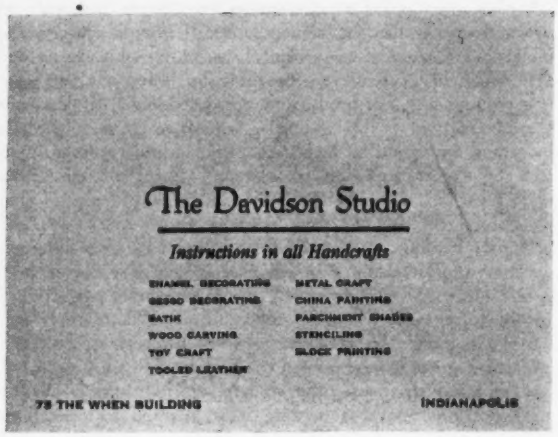
THE CASE FOR DESIGN

Dorothy Allen, New York, N. Y.

In a quotation in the May, 1925, number of the INDUSTRIAL-ARTS MAGAZINE under the title "Trapping the Quick Brown Fox," is expressed a rooted conviction of scorn against vocational printing. The noticeable paucity of material on printing in the industrial- and vocational-education magazines may be another indication that school printing departments are under a cloud, though it is conceivable rather that the engrossing interest in these shops refuses time for those entrances and exits in contacting the outside. If the amazing statement be anywhere true, that the more alert boys shun printing in favor of almost any other shop work, it seems probable that the hitch in that shop may lie, as the editor suggests, in so simple a problem as teaching the case. In the Indianapolis technical high school new print-shop direction under Mr. Auble gave enrollment of the last two years such an impetus that the print shop is now too popular for comfort.

During the past year advanced students of printing won distinction in their scholarship record for both shop and correlated studies. One wonders whether they are superior boys who elect printing, or does printing accomplish for them marks of superiority? It is, however, profitless, as is the famous case of the hen or the egg, to argue these points.

It is a matter of enthusiastic repetition that the educative possibilities of printing are in advance of most other vocational courses. So naturally has printing stimulated boys and men to curiosity in educational highways, that numerous are individual examples in which the educative process has been accomplished with happily little intervention of the public school. The teacher of printing students may look upon his object in the classroom as that of aiding and abetting these contacts that the student comes by naturally through the material he handles. Ben Franklin, patron of printers, is the suggestive example of the lengths to which printing may stimulate toward intellectual curiosity.



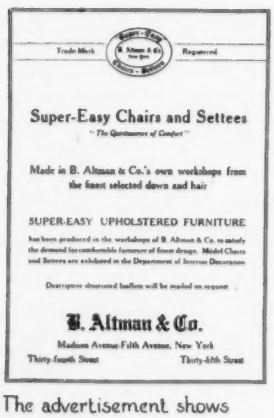
A "HORRIBLE' EXAMPLE.
(Illustration showing the lack of balance in an announcement card.)

The Case for Design

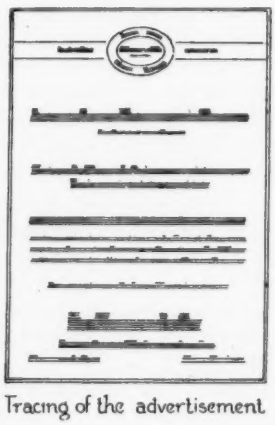
The chances looking toward a certain art insight through handicraftmanship are especially convincing in printing among vocational subjects. From the evidence it is hard to believe that the teaching of design to printers has been pursued with the seriousness it merits. In theory, the boy who cannot develop a joy in creating beauty does not exist; in practice, rarely. A vigorous shop course linked to a vigorous design course mutually generates in the boy the enthusiasm needed to tide him over rough going in his early struggles with type. *Method* again assumes importance, and especially so, since the majority of students feel that in design they are entering foreign territory. Training is toward appreciation and creative

October 28 George Thompson

REARRANGEMENT OF ADVERTISEMENT


Super-Easy Chairs and Settees
Made in B. Altman & Co.'s own workshops from the finest selected down and hair
SUPER-EASY UPHOLSTERED FURNITURE
B. Altman & Co.
Madison Avenue-Fifth Avenue, New York
Thirty-fourth Street
Thirty-fifth Street

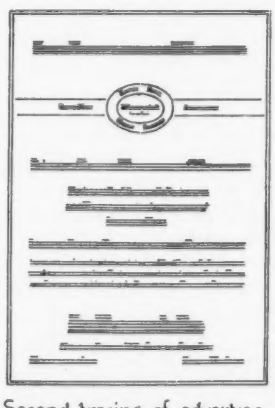
The advertisement shows poor grouping



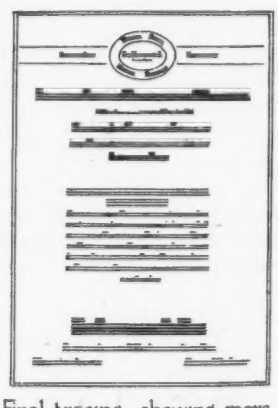
Tracing of the advertisement

George Thompson

REARRANGEMENT (continued)



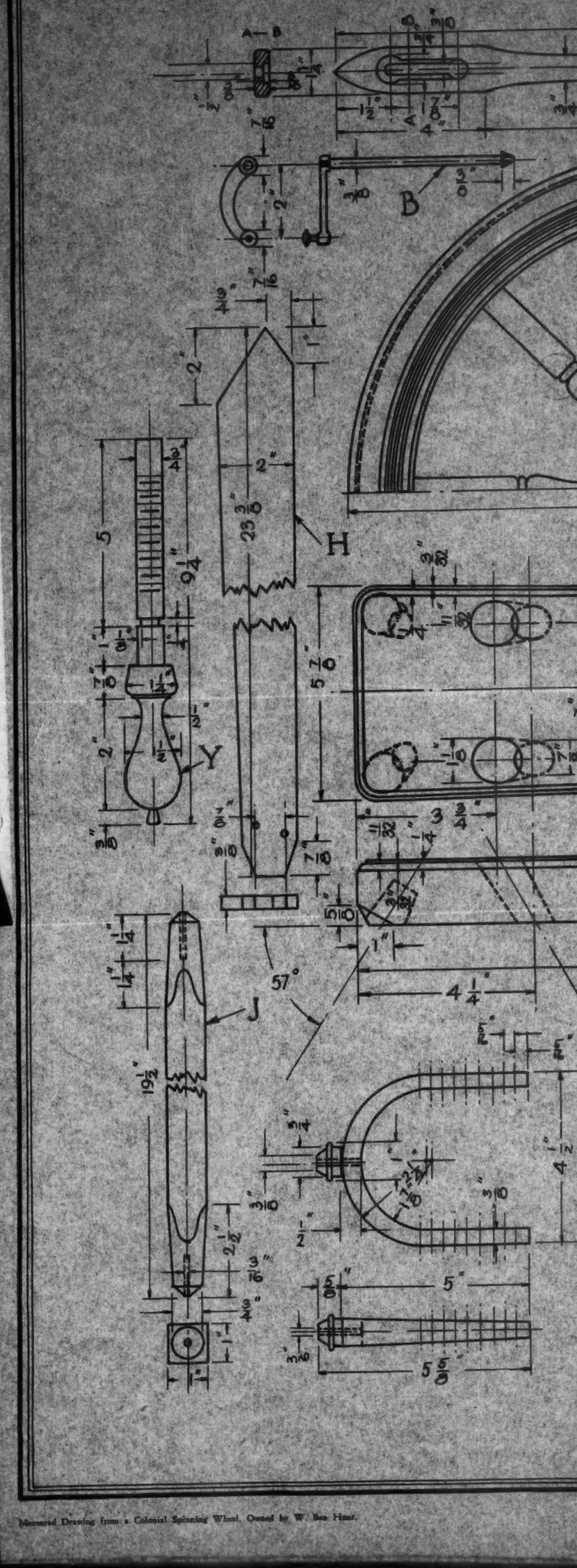
Second tracing of advertisement, showing rearrangement of groups.



Final tracing, showing more attractive and readable grouping

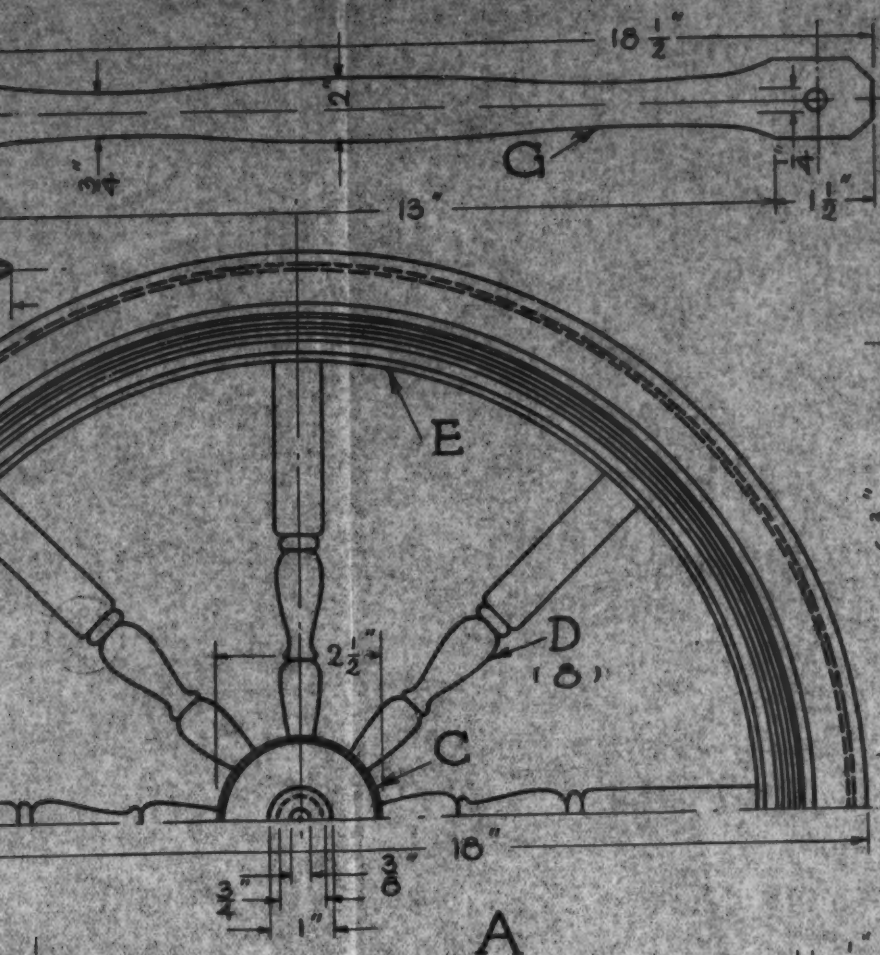
WORK OF CLASSES IN FIRST YEAR PRINTING DESIGN.

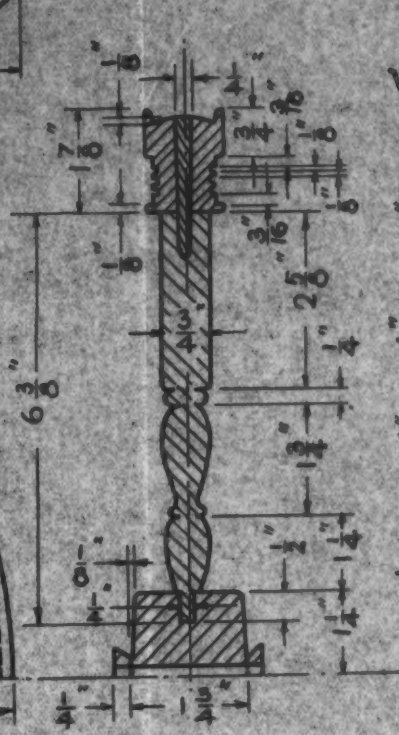
A COLO

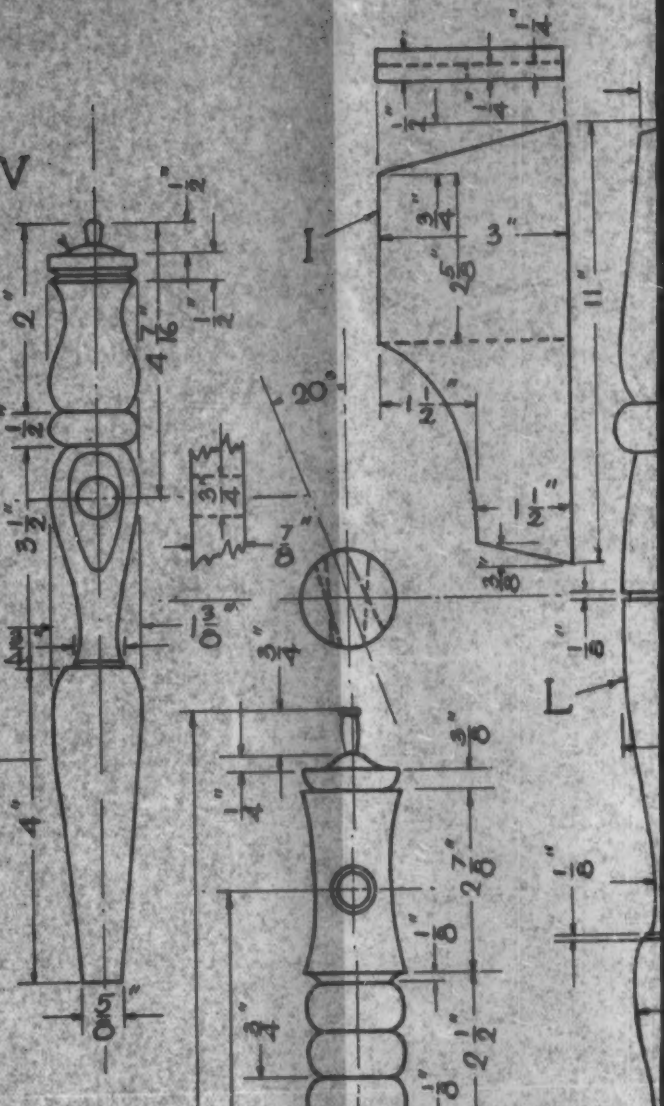


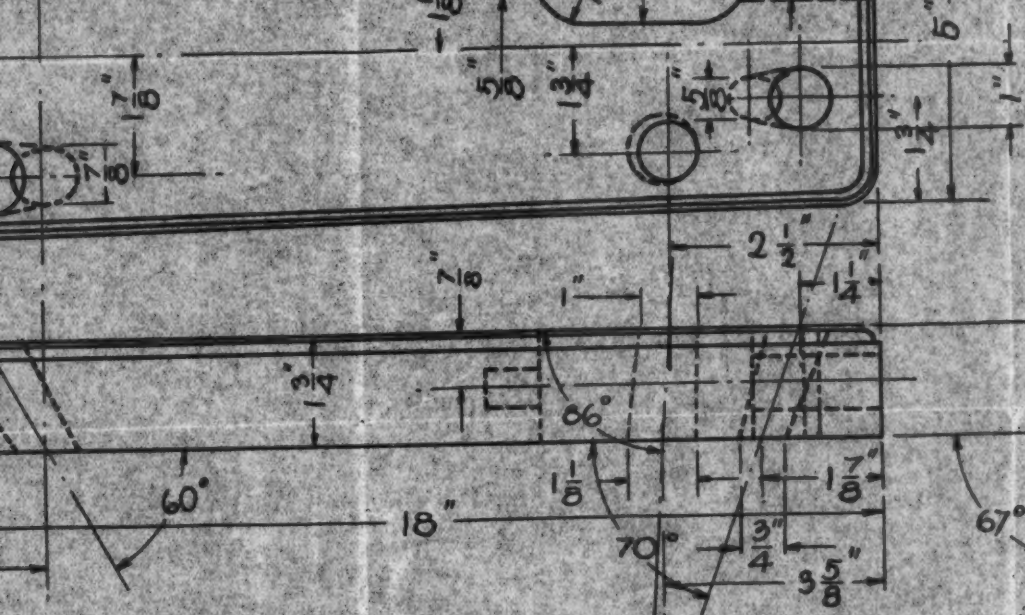
Measured Drawing from a Colonial Spinning Wheel, Owned by W. Bee Hunt.

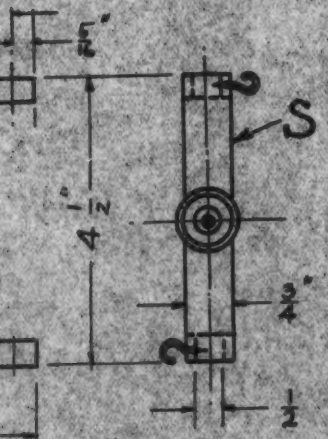
LONIAL SPINNING

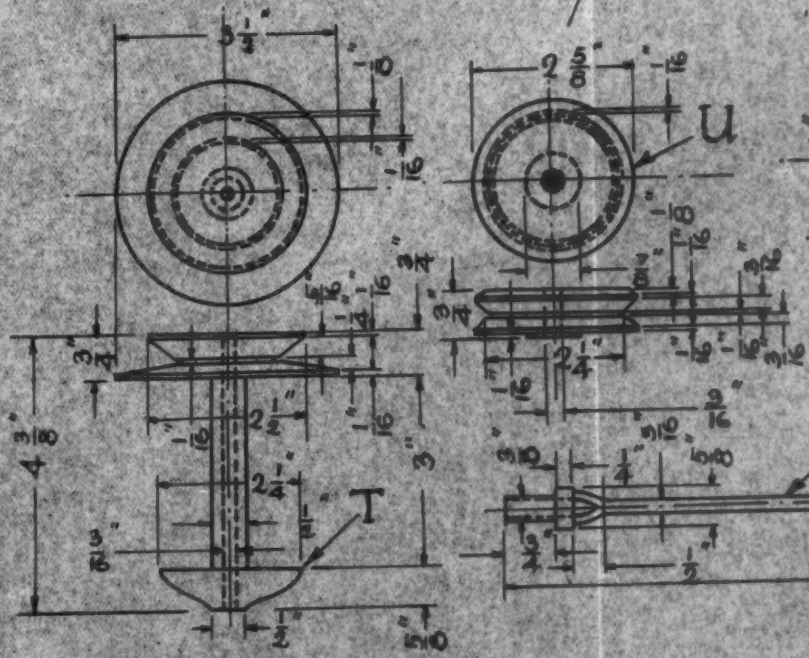


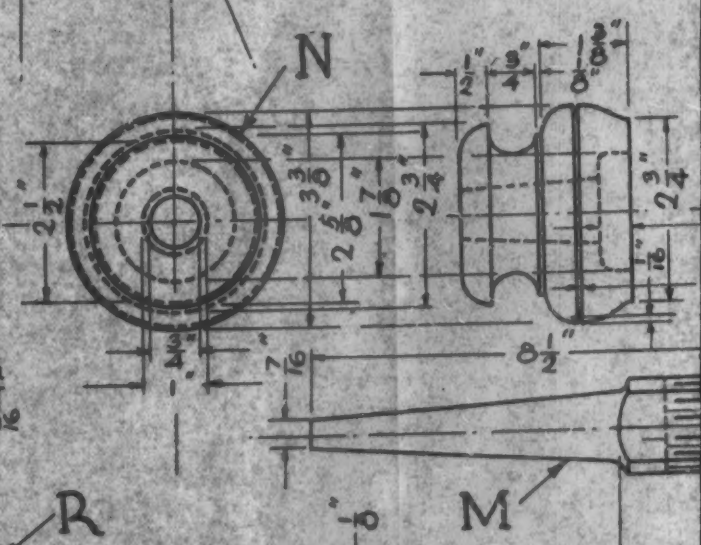




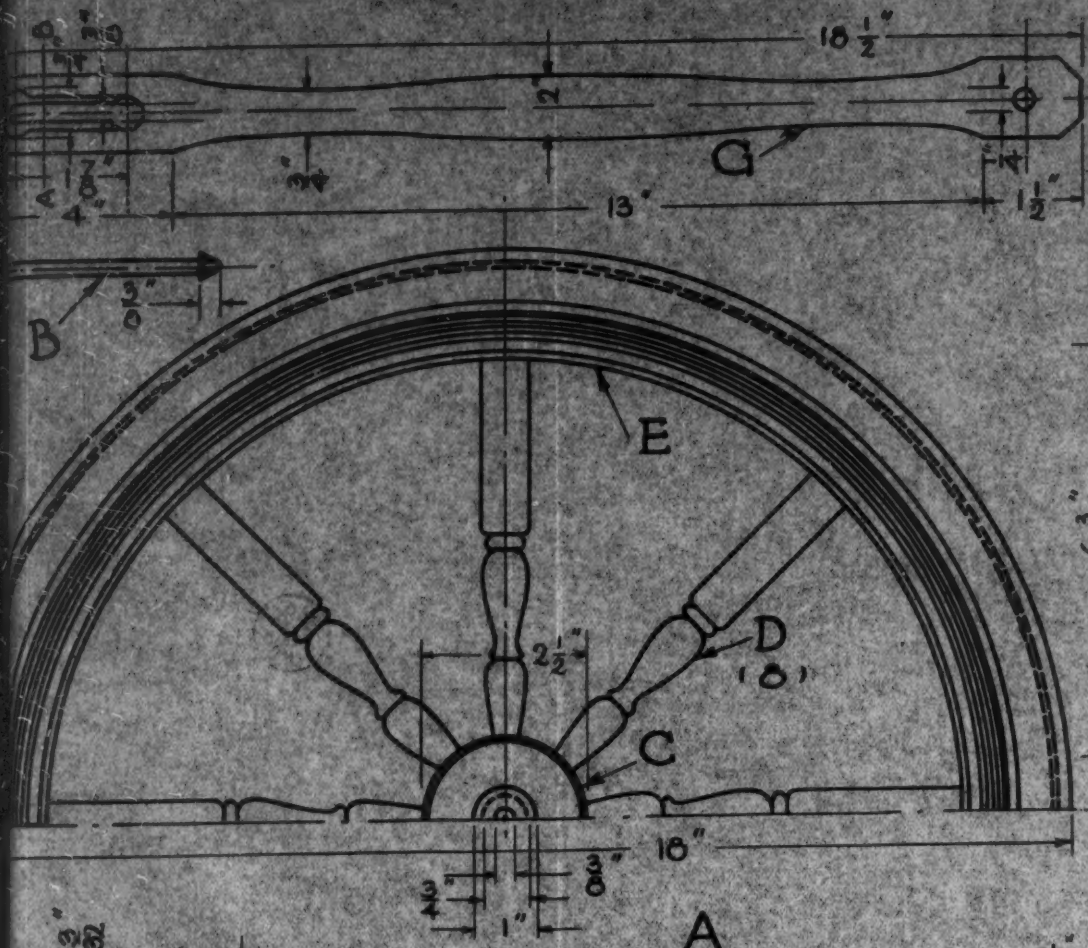


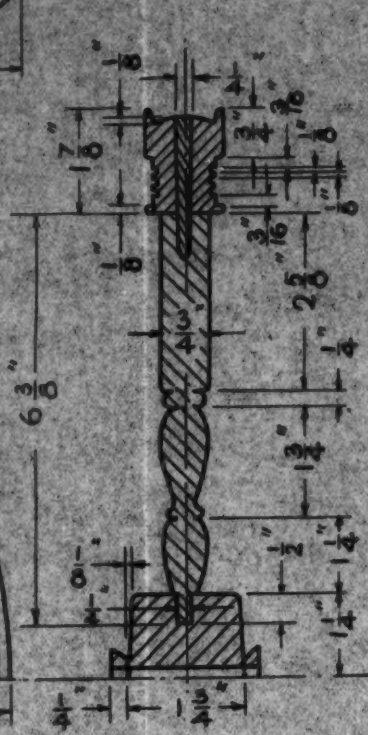


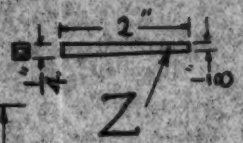


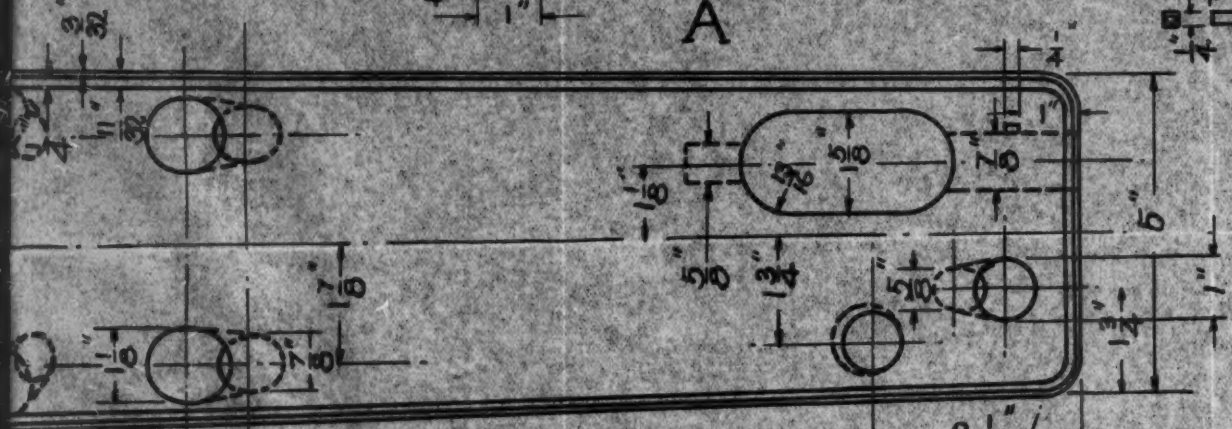


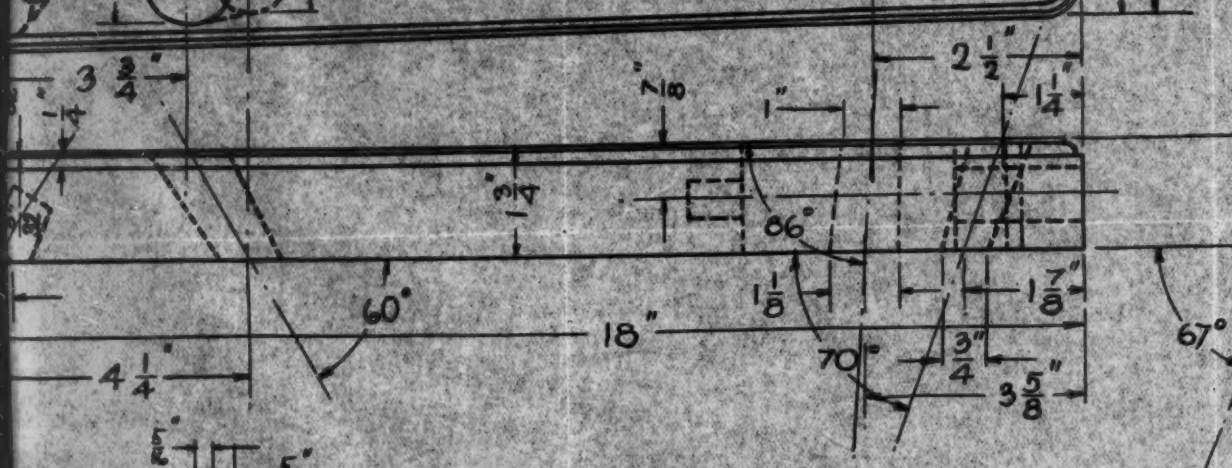
OLONIAL SPINNI

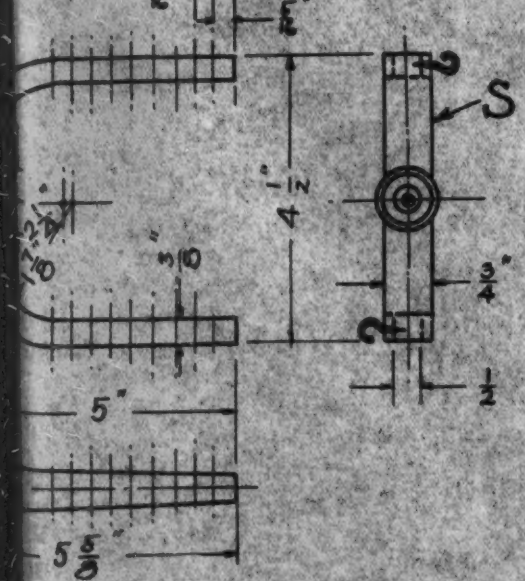


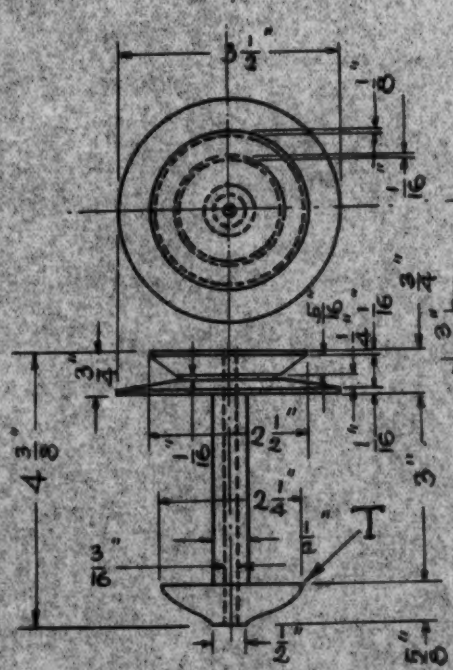


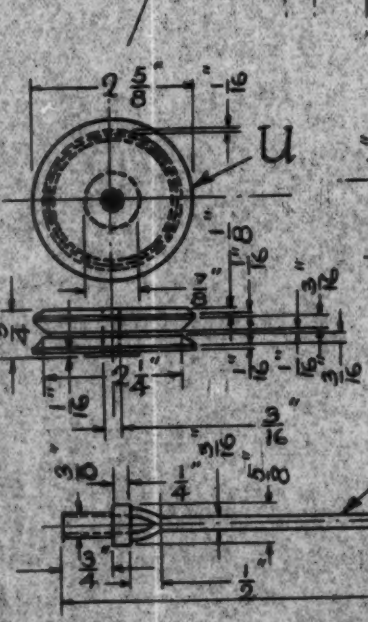






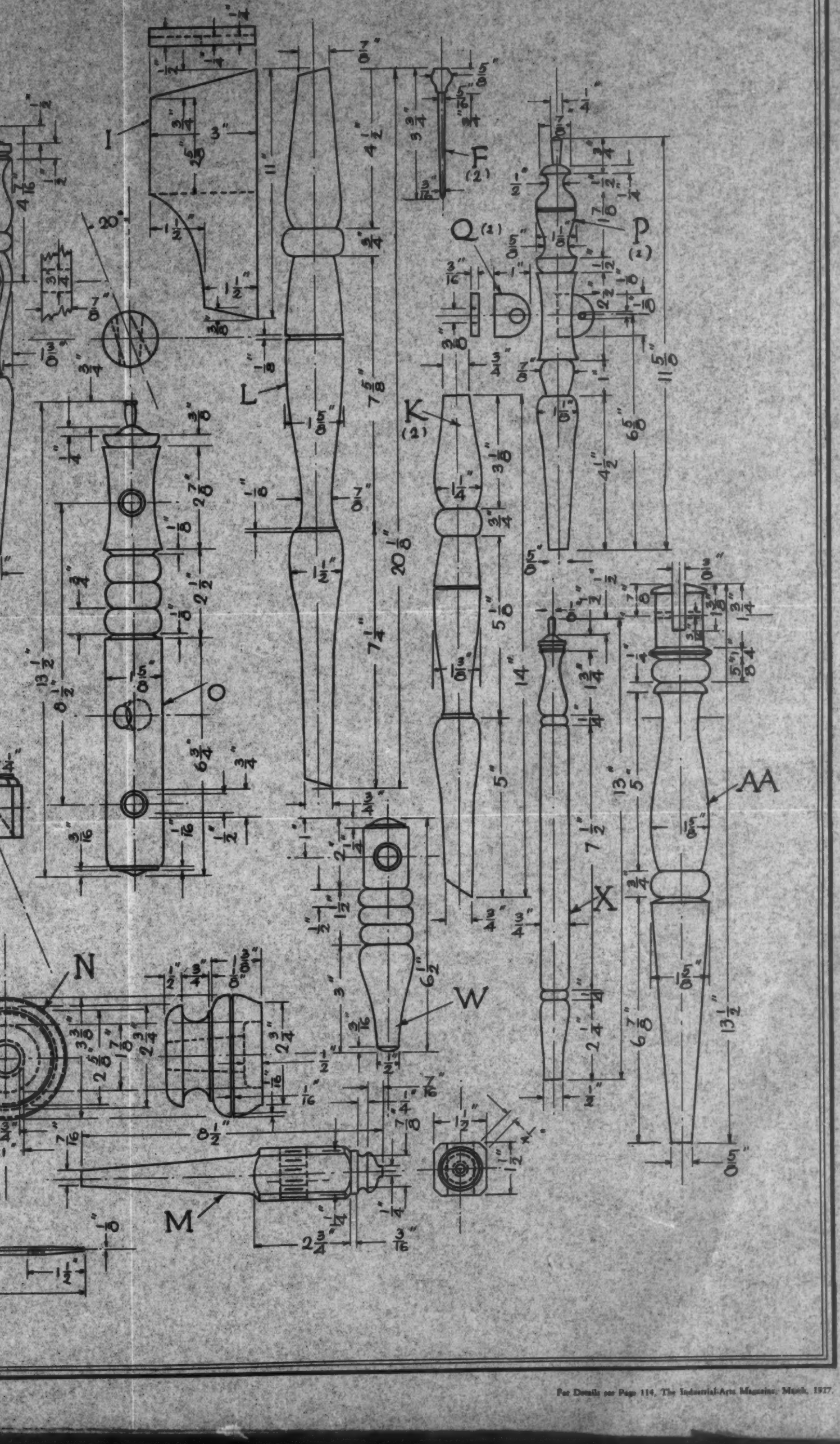






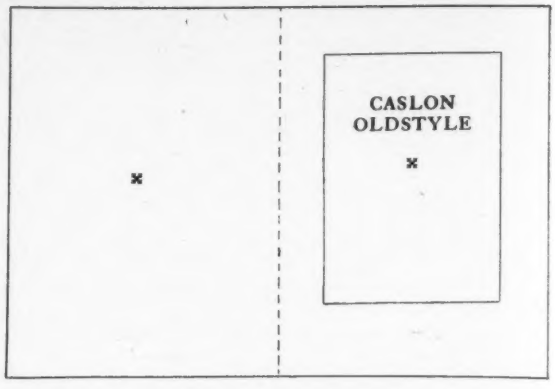
To be Misprinted for School Shop Use Only.
© 1927, The Bruce Publishing Co.

ING WHEEL



For Details see Page 114, The Industrial-Arts Magazine, March, 1927.

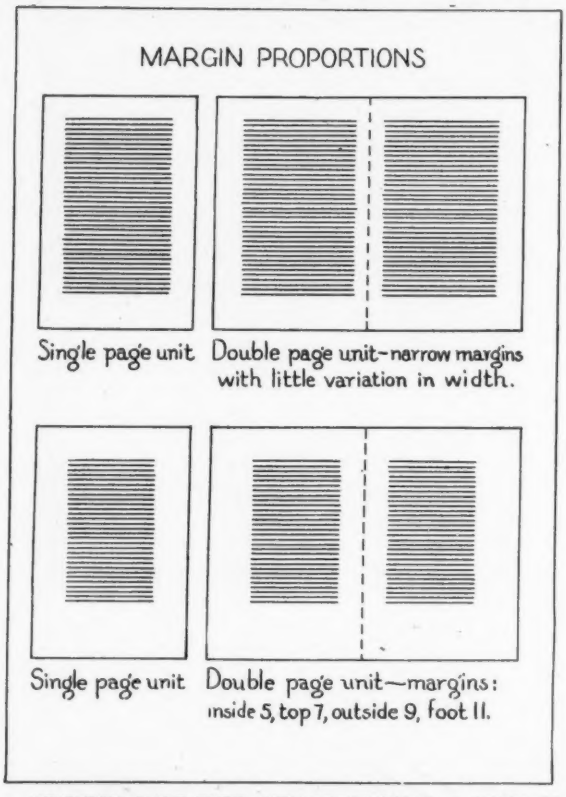
LAYOUT FOR FOUR-PAGE CIRCULAR.



A SOLUTION OF THE FOUR-PAGE CIRCULAR PROBLEM.

may be, looking toward the hope of training the future master craftsman.

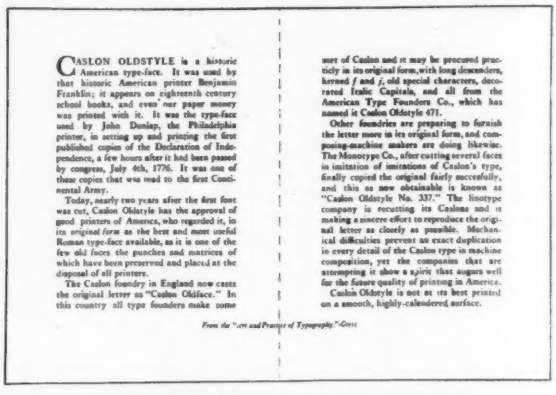
Dependence on arbitrary forms for fashioning business cards, or other printed jobs, again makes for the evolution of that stubborn fellow in the craft. Since forms are man-made, out of the stuff of appreciation, the boy may be given


MARGIN PROPORTIONS
Single page unit
Double page unit-narrow margins with little variation in width.
Single page unit
Double page unit—margins: inside 5, top 7, outside 9, foot 11.

STUDENTS MADE THEIR OWN "TEXTBOOKS"—A SERIES OF CHARTS FOR REFERENCE. THE CHART OF "MARGIN PROPORTIONS" FINDS ITS APPLICATION IN THE LAYOUT FOR INSIDE AND COVER PAGES OF A SIMPLE FOLDER.

the benefit of the doubt in stimulating him to make his own adjustments. The veriest freshman is quick to apprehend without rules, errors of balance shown in the example of the announcement card (see illustration). From examples and experiment he works through the known to the new.

Material urging upon the student a love of his craft is plentiful in this day of a renaissance of fine printing. Any boy has access to beautiful sheets of "direct-mail" advertisements in the waste-paper baskets, to which they descend with


CASLON OLDSTYLE is a historic American type-face. It was used by that historic American printer Benjamin Franklin; it appears on eighteenth century school books, and even our paper money was printed with it. It was the type-face used by John Dunlap, the Philadelphia printer, in setting up and printing the first published copies of the Declaration of Independence, a few hours after it had been passed by congress, July 6th, 1776. It was one of these copies that was read to the first Continental Army.

Today, nearly two years after the first font was cut, Caslon Oldstyle has the approval of good printers of America, who regarded it, in its *original form* as the best and most useful Roman type-face available, as it is one of the few old faces the punches and matrices of which have been preserved and placed at the disposal of all printers.

The Caslon foundry in England now casts the original letter as "Caslon Oldface." In this country all type founders make some sort of Caslon and it may be procured practically in its original form, with long descenders, kerned *f* and *y*, old special characters, decorated Italic Capitals, and all from the American Type Founders Co., which has named it Caslon Oldstyle 471.

Other foundries are preparing to furnish the letter more in its original form, and composing-machine makers are doing likewise. The Monotype Co., after cutting several faces in imitation of imitations of Caslon's type, finally copied the original fairly successfully, and this as now obtainable is known as "Caslon Oldstyle No. 337." The linotype company is recutting its Caslons and is making a sincere effort to reproduce the original letter as closely as possible. Mechanical difficulties prevent an exact duplication in every detail of the Caslon type in machine composition, yet the companies that are attempting it show a spirit that augurs well for the future quality of printing in America.

Caslon Oldstyle is not at its best printed on a smooth, highly-calendered surface.

From the "Arts and Practice of Typography"-Gress

INSIDE PAGES OF FOUR-PAGE CIRCULAR.

having exhibition facilities. These live with the student of printing in anticipation as a fascinating possibility of achievement.

Meanwhile he goes "behind the scenes" as he examines into the "ropes and pulleys and electric switches"—the mechanics of staging his effects, for the kinship between the craftsman and his materials has not been sacrificed with the acceptance of the machine in the printing industry. Patience in learning the case has some rewards in the satisfactions that grow out of creative effort.

In deference to the vocational-education spirit of carving away all extraneous matter, one may not boast of divergent avenues of art appreciation that printing design may open to the student. One may make certain inferences, however, of what might be accomplished between eager youth and interested preceptor.

Special Railroad Rates for Western Arts Meeting

Mr. Raymond T. Fell, Secretary of the Western Arts Association, has announced a special railroad rate of one and one-half fare on the certificate plan for persons attending the forthcoming meeting in Milwaukee, in May.

The reduced rate has been granted by the New England Passenger Association of Boston; the Trunk Line Association of New York; the Southeastern Passenger Association of Atlanta, Ga.; the Trans-Continental Passenger Association, the Western Passenger Association, and the Central Passenger Association of Chicago.

Persons attending the convention who pay 67 cents or more, one way, may be allowed one and one-half privileges, provided 250 certificates are presented at Milwaukee for validation.

GOLD LEAF SIGNS AS PROJECTS IN JUNIOR HIGH SCHOOL INDUSTRIAL ARTS

Joseph C. Park and Wadsor M. Scoville, Oswego State Normal School

In connection with the art and industrial arts work in some schools, signs of various kinds are made of wood, sheet metal combined with art glass, and ornamental wrought iron. In this article we are dealing only with signs made of wood with gold-leaf letters. In beginning a project in the building of a sign many things are to be considered in the analysis of the project and in the *what to know* and *what to do* in bringing the sign project to a completion. One of the first questions to be raised is:

What is a sign? Or, what are signs, anyway?

The dictionaries tell us that a sign is:

(1) A visible mark or impression, whether natural or artificial, accidental or purposed, serving to convey information, suggest an idea, or assist inference; a distinctive guiding indication to the eye.

(2) A conventional mark used as an abbreviation for a known meaning, as mathematical signs to show the relation of numbers.

(3) Something displayed to announce the presence of anyone, a standard, a banner.

(4) An inscribed board, plate, or space, or a symbolical representation or figure, serving for guidance or information, as on or before the place of business, or of some public resort, or along a road, as a merchant's sign, a tavern sign; a swinging sign; a tin sign, a signboard. Places of business and especially taverns were formerly often known by the names of the figures or representatives used by them for signs—as the Cock and Bull for a tavern, the Bible and Keys for a bookstore. The barber's pole seen today is a pole striped spirally with alternate bands of color, generally red, or black, and white. The striping is an imitation of the ribbon with which the arm of the person who had been bled is bound up and originally indicated that the barber combined minor surgical operations with his other work.

(5) A symbolical representation, a symbol; hence in absolute use, a symbolical significance, as bread and wine in church communion.

(6) A representative thing; a tangible, audible or historical token, symbol or memento; an exponent or indicator, as fire destroyed; baleful sign of fever. The ampulla were the special signs of Canterbury pilgrimages. The cross was the sign of pilgrimages to the Holy Land.

How shall a sign be built? Or what are the fundamental principles to be kept in mind?

In designing and building a sign three general principles must be kept in mind:

1. The sign must provoke attention.
2. It must be suitably designed as to thought provoking content and the material and workmanship must be right.
3. It must be pleasing.

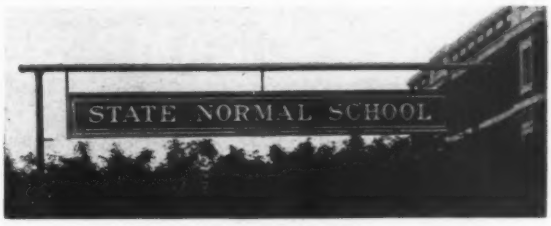


FIGURE 2.

The following specifications may be of interest to those contemplating the building of signs made of wood with gold-leaf letters.

The first and one of the most important steps in constructing a sign is the design. It must be neat and well balanced, yet a very simple design. Avoid too much fancy work or gingerbread as it is called in the trade. A good source for ideas on sign layouts can be found on the main street of your town. After the design has been completed, the details of construction are next considered. Here again one of the most important items is the use of good, dry, well-seasoned pine. After the sign back is made the backband and moldings are put on. The sign board is now ready for the letters. The letters can be designed and sawed out on the band saw or they may be purchased from a supply house for sign painters. The letters used on most of the signs shown in the illustrations were purchased from Spanjer Brothers, Newark, N. J. The face of the signboard and the back of the letters should be given a priming coat.

To mount the letters, place the letters on the signboard in proper order, spacing them carefully. Tack each letter with a small finishing nail, leaving the head so that the nail can be drawn if necessary. After the letters are tacked in place, set the sign up and step back about fifteen feet to get the effect of the spacing. Rearrange the letters if necessary until the correct effect is obtained; then set the finishing nails and proceed with the finishing.

The finishing process is very important. The following outline may be of help in doing this work:

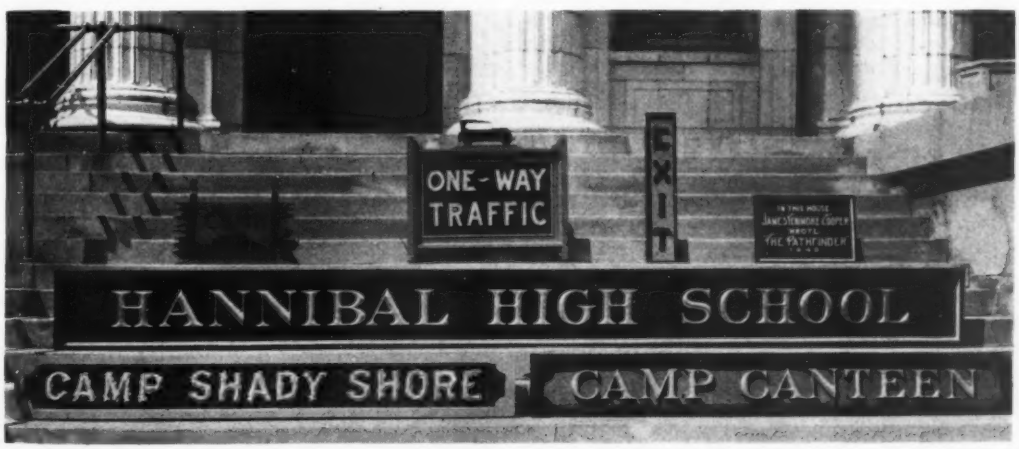


FIGURE 1.

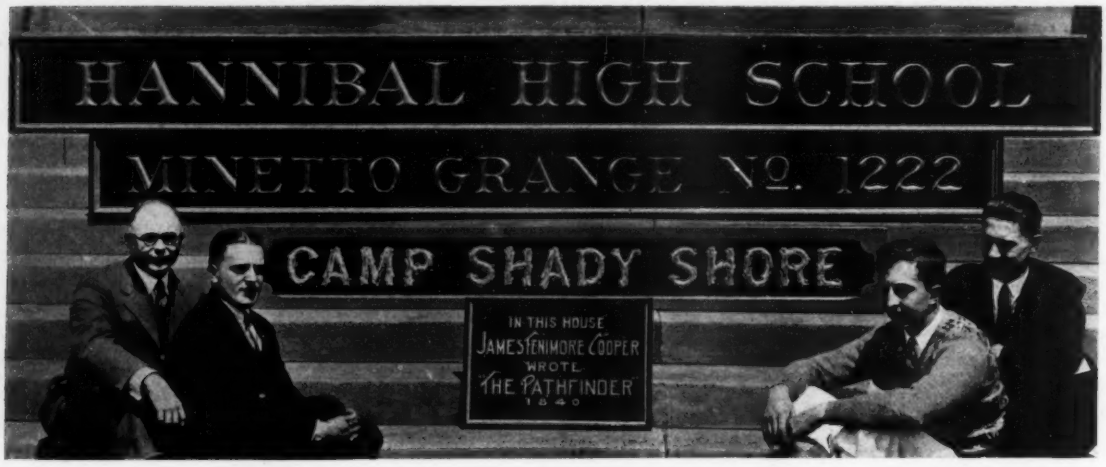


FIGURE 3.

Painting: (a) Clean the surface; (b) sand it smooth; (c) give it a thin coat of shellac; (d) sand the shellac; (e) give it a prime coat of paint; (f) putty the nail holes; (g) sand it lightly if necessary; (h) apply a second coat of paint.

Gilding: The laying of gold leaf is done to produce certain decorative effects. The material is quite difficult to apply, but the amateur sign builder will be able to get good results with a little practice. The materials needed for gilding are gold leaf and gold size. The tools necessary are: (a) A gilder's tip; (b) a brush for applying the size; and (c) cotton for burnishing.

Procedure: (a) Size the surface to be gilded; (b) then take the gilder's tip and draw it over the hair on worker's head; (c) cut the gold leaf to the size wanted with a finger nail; (d) lift the gold leaf with the tip and lay it on the surface to be gilded; (e) after the surface has been covered carefully with gold leaf, take a piece of fine cotton and brush the surface lightly to remove any loose particles of gold leaf. It is a good plan to put a little yellow coloring in the size in order that tiny defects in the gold leaf are not noticeable. Do not attempt to lay the leaf until the size has become tacky.

Smalting: This is the last step in finishing the sign. Smalt is a sand or granulated glass, dark colored usually, that produces the beautiful velvety background so essential to good signs. Proceed as follows: (a) Be sure that the last coat of paint is dry; cut in the letters and all places where the smalting is to appear with a final coat of paint; (c) while the paint is wet, sprinkle the smalt over the surface to be covered; (d) after the paint has dried, turn the sign upside down so that the loose smalt will drop off, leaving a background of wonderful beauty and permanence.

The signs shown in the illustrations accompanying this article were made by men in the industrial teacher training department of the Oswego State Normal School, during the spring of 1926, in a class conducted by Mr. Scoville. It will be noted that a variety of signs are shown in these illustrations.

In Figure 1, the large Hannibal High School sign was built by Mr. Fred Carey. This sign has an 8-inch Roman letter extended once. Wood letters are extended or condensed to fit a given space. Thus, in ordering a Roman letter specify regular Roman, or Roman extended once, or Roman extended twice, or condensed once, or condensed twice. The sign "Camp Shady Shore" is made with rustic letters. Note the automobile on top of the "One-Way Traffic" sign to indicate the direction of the traffic. This sign is read from either side. "Camp Headquarters" is a rustic letter sign with wrought-iron hangings. In use this sign is suspended from a wrought-iron bracket attached to a concrete post.

Figure 3 is an interesting picture. The sign "In this House James Fennimore Cooper, etc.," is in place in front of the Cooper house at 24 West 2nd St., Oswego, N. Y. The sign Minetto Grange No. 1222 was built by Mr. Maynard Fletcher. The men shown in Figure 3 are, from left to right, Mr. Scoville, Mr. MacDonald, Mr. Russell, and Mr. Carey, all sign builders and teachers.

Figure 2 is a good sign with gold-leaf letters. It is supported twelve feet above the grade on a 3-inch galvanized iron pipe frame which is painted black. The details of this support were published in the INDUSTRIAL ARTS MAGAZINE for November, 1925, page 438.

A good sign must "fill space without taking away from space."

A SHOP FOREMAN PLAN

Paul V. Wilcox, Grand Island, Nebraska

About a year ago some form of shop organization seemed necessary to me if I hoped to accomplish anything in the way of worth-while manual arts. I was working with six large classes every day and after the work for the semester was under way I paused to take stock of conditions. It seemed to me, as I thought of it then, that the classes were working me and that I was not getting much work out of them. There seemed to be so much to be done in the way of getting out supplies, checking the roll, cleaning up at the end of the period, and a hundred other jobs in some way related to getting thirty youngsters exposed to the shop subject they had down on their program.

I had heard that some shops are using the foremanship system and various other systems, but I didn't seem to have any definite idea just why or how they were doing it. I had heard some poet or philosopher make the rather inelegant statement that when boys were once given responsibility they fairly "ate it up." I thought of course that he couldn't possibly have meant the kind of boys I had in my shop; that surely he must have meant a select group.

I decided, however, to put this foremanship idea on trial, and although the first effort at reorganization didn't seem to lighten my load much, the plan now in use takes a heavy load from my shoulders and I believe increases the efficiency of instruction many times over. I am now in the position to concede that perhaps poets and philosophers have a constructive place in the world after all.

The most effective work under the foremanship plan was not done until I was given permission to use a visiting day to view the work of other shop teachers. The things I observed in these shop visits convinced me that any school gains a great deal by allowing the shop teachers time to see other shopmen at work. One visit I made was of particular value to me because I happened into a shop where the foreman plan was in operation. I talked with the instructor a while about his shop and his organization of material, etc. The period drew to a close, his classes cleaned up and took seats in an orderly way, and after the bell rang he dismissed them. When the new class came in we were still talking shop and I supposed of course that he would excuse himself and start his new class to work. When he seemed to have no intention of doing this, I mentioned that I didn't want to bother him if he wanted to get his class started. He told me that his foreman was calling the roll and putting the class to work.

I began to see from watching the work that I was on the wrong track in my foreman plan—that my foremen were not being given enough responsibility and consequently I was running myself ragged in caring for useless detail that youngsters should handle while I performed more of the actual teaching.

When I returned to my own shop, a new six-week period made it convenient for me to reorganize along new lines. I had the boys of each class elect a foreman and a vice-foreman in the regular parliamentary manner, and it was understood that these officers would hold office for the semester unless a new election was petitioned before the term expired.

We have a system of calling roll that seems to be effective in making the boys think of what they are going to do during the period. A card is ruled off for each member of the class into five divisions, one for each day of the school week; and as the roll is called each boy answers with what he is going to do. If he is to be on the same work as had been entered previously, he answers "same." This job of roll calling is now turned over to the foreman, together with the matter of making out the attendance slip for the period.

The foreman is also given a key to supplies and issues all supplies and such equipment as is kept locked. He also brings in the people who seem to be out of work so that the instructor can check up on them or re-assign them to a job. In the home mechanics work the foreman keeps the job record of each boy, a job being entered after the instructor has approved it. The assistant foreman takes care of the room where unfinished work is stored and the project-room locker of his class.

We have various jobs assigned members of the class and these are listed on a mimeographed form and the names filled in after the job. We have two cabinets attached to the wall for the tools. These are opened at the beginning of the period and the boys help themselves to necessary tools for their jobs, putting their number or check on the hook where the tool hung. At the end of the period a tool clerk checks the tools by the numbers and with the aid of the picture behind every tool. When the tools are checked in, a glance from the instructor verifies the report of the tool clerk and the panels are closed till the next class uses them. I am partial to this method of checking because the boys get the tools they want when they want them. There is no waiting in line for an indifferent tool checker to hand them two or three tools before he gets the right one and when there is no line-up, there is not the pushing, shoving and laughing that usually attends the line-up method.

Another one of the jobs is to run the machines. One boy is responsible for running and caring for the machines a week at a time before the job is rotated to another. The paint- and lumber-man sees that the paints are in order with all lids on the jars, etc., and that the lumber is straightened. One squad of three boys is assigned to sweep the machine room, a squad of two to sweep the main room, and there are two brushers for each room.

The foremen are usually the best members of the class in leadership qualities, because a boy must have outstanding qualifications to be chosen by the fellows. The way in which these shop foremen have taken over the duties and responsibilities assigned to them convinces me that more and more of my teaching load can be assumed by the youngsters themselves, and I am always looking for ways and means of bringing this about.

In offering these suggestions on the foremanship plan I realize that it is not a new idea by any means and that many shopmen have been using it successfully in their shops for years. I do believe, however, that many instructors who try to do all the teaching themselves could lighten their load and improve their work through this means of cooperation with the boys.

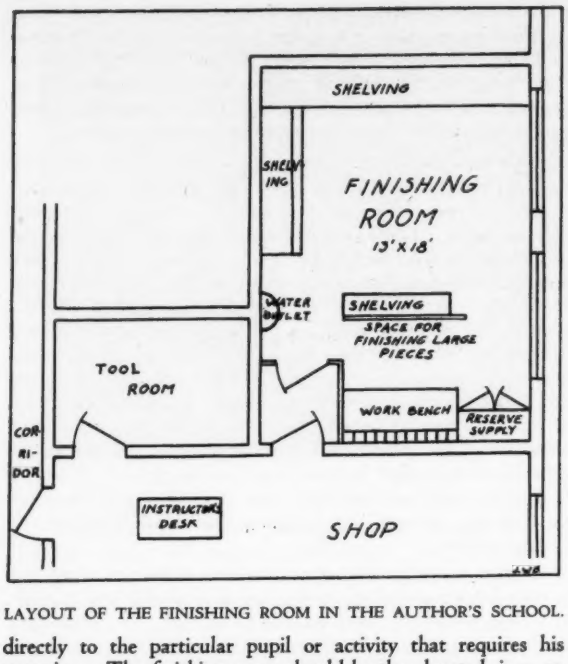
SOME TROUBLESOME PROBLEMS OF THE FINISHING ROOM

J. W. Bollinger, Tulsa, Oklahoma

Few phases of manual arts work offer as much difficulty as does the organization of the finishing room. Instead of "difficulty," some men would say "annoyance." Nevertheless, people will judge a pupil's work largely by the finished appearance it presents, so that the matter of finishes is important. Much has been said and written in an effort to ameliorate the situation. This paper does not aim at a final solution for the question; there is no single solution; each instructor will find it necessary to work out an answer according to his own situation. Here will be presented some tangible suggestions, some ways of doing the job.

The first question is: "Where shall we do our finishing?" Under any circumstances, a finishing room, be it ever so small, is preferable to doing the work in the same room in which the other activities are carried on. Some finishing *could* be done in the same room—staining, filling, and waxing—in fact, some instructors find it *desirable* to do these jobs in the same room, in order to separate this work from the other operations. But shellacking, varnishing, enameling, and lacquering should be carried out in a room separate from the shoproom. The obvious difficulties are: First, dust particles are always flying through the air, which settle on the work and mar the finish; second, shop ventilation and temperature can not be well regulated for drying finishes. Neither does the shoproom usually have sufficient storage space for keeping completed articles.

Another advantage can be derived from the separate finishing room, if the room can be strategically located. In most shops, the instructor's desk is located in a central or strategic position in the room, so that the instructor can go



LAYOUT OF THE FINISHING ROOM IN THE AUTHOR'S SCHOOL.

directly to the particular pupil or activity that requires his attention. The finishing room should be thus located, i. e., so that it is but a few steps from the strategic center of the shop to the door of this room. It will then be possible "to keep tab on" who goes in, when he goes in, and so on, enabling the instructor always to keep close check on what goes on in the room. The disadvantages of rooms otherwise located need not be mentioned.

Accompanying this paper is a plan of a finishing room, intended to meet the needs of an average shop. The size of the storage space will depend, of course, on such factors as the number of pupils to be accommodated, the size of the projects, and the like, and will have to be determined by the needs of each school. In general, a small compact arrangement is to be preferred over too large a space.

The purpose in presenting the plan is to show the general location of the room and how the area is used.

The first point to be considered is the door. In the plan is shown a double door, the purpose of which is to keep as much dust out as possible. At first this arrangement may seem impractical, but it can not be questioned that with two doors placed as shown, almost all dust can be kept from getting into the finishing room via the doors. If these doors and also the partition be made with ample glass area, they will not be quite so impractical. These doors should be kept closed as much as possible.

To further minimize the dust evil, there is in the plan a water outlet, where a floor brush, dustpan, and sprinkling can are to be kept. The floor of the room should be sprinkled several times each day, and should be swept up at least once daily, depending on "traffic." It will be necessary frequently to take a damp rag and go over shelving, ledges, sills, etc., to remove dust accumulations. "Out-of-the-way places" should not be allowed to exist, and should never be permitted to become catchalls for dust and dirt.

The plan shows a partition separating the workbench from the storage space. This partition will prevent the completed articles from becoming spattered with finishing materials. It also makes possible more shelving. Shelving should consist not of solid boards, but of 4" or 6" strips, separated by 2" or 4" spaces, so that the air may circulate freely around the articles stored. The shelves should be spaced far enough apart to hold the average-size project. Some shelves should be spaced farther apart, to permit the storing of large pieces. Underneath some of the shelves should be put some hooks, for hanging up articles that can be hung up. Near the edge of some of the shelves, some narrow strips are to be placed, for leaning objects which are finished all over. In putting pieces on the shelves to dry, it is advisable to put pieces finished first on the upper shelves, and succeeding objects below. If a piece of work were to be put just above a newly covered piece, some dust would be stirred up and settle on the new piece. A good rule is to keep objects stored as high as possible because dust particles become denser nearing the floor.

The paintroom should be ventilated. It is a decided mistake to keep pieces to be dried in a room which is air-tight. Some of the turpentine, linseed oil, and other materials must evaporate in order for the finish to dry, and these products must be carried off. Excessive ventilation would be even worse than no ventilation, because of the dust evil again, and because of temperature regulation. Ordinarily, a finishing room will not require much ventilation; just enough so that the products of evaporation may be carried off freely.

The finishing room ought to be kept at a fairly uniform temperature at all times. Somewhere between 75° and 80° F. would be ideal for most work. Here again, the best arrangement would be to have a thermostat control, set for keeping the room always at the desired warmth. The blemishes produced by excessive temperatures are well known.

We may now consider the bench for doing the finishing. Here again the instructor's circumstances and preferences will largely determine what can best be done. The bench in the drawing is 32" high, 24" wide, and 66" long. It is large enough for two pupils to work on at one time; the size of the top is such that two newspapers can be spread out over it, to cover it completely. The newspapers can be removed after use, and thus it is possible to keep the top always looking tidy. A supply of newspapers is kept on a rack under the bench. If the top of the bench is clean, the pupils are much more apt to keep it clean, and will take a certain pride in being clean about the job. This method of using newspapers has been found preferable to several other methods which have been tried.

The finishing materials which are to be kept in continuous use are kept on a shelf a few inches above the top of the bench. No cans are to set on the newspaper top. There is a place for each article, with each place plainly marked so that there can be no question as to where it is to be kept. When there is a place for everything, pupils usually keep everything in its place.

The bench has a back and sides, high enough so that finishing materials shall not be spattered on the wall or on the floor nearby.

The next point to consider is the handling of the finishing materials themselves. The diagram shows a place for a metal cupboard, with doors and a lock on it, in which the instructor keeps reserve supplies. This cupboard is close to the workbench, where it can be gotten to readily as needs arise. On the bench itself, are kept only materials which are in continuous use.

How to properly keep these items is quite a problem. The first essential is to provide suitable containers for the various substances. Tin cans, which can be sealed air-tight, and also readily opened, are excellent. Pupils are glad to bring such cans from home, or a supply can be purchased. It is absolutely necessary that all cans be kept closed air-tight when the contents are not in use, for in all cases the contents would be damaged by exposure to the atmosphere. The worst of it is that this damage can not be repaired. Paints and lacquers are usually in such containers when purchased. Shellacs and varnishes should be kept in similar fashion. Only a small amount of material is to be kept in the "circulating" containers at one time, the supply to be replenished when necessary by the instructor. This has two advantages; first, if the contents are spilled, not much is lost; second, if the cans are inadvertently left open, only a small quantity of material is wasted. After these cans have been used for some time, they become

coated with a scum, formed while the cans were open, and by stroking the brush off on the edges. This scum will become so thick as to make it difficult to close the cans. When this condition exists, it is advisable to discard the cans and to use new ones. The best way to clean such cans, if they do not have soldered joints, is to hold them over a fire with a poker, and burn the scum off. A little cleaning with steel wool will then put the cans into good shape again.

The matter of keeping brushes is the most troublesome, perhaps, of all the problems of the finishing room. It goes without saying that brushes should either be cleaned and kept dry, or should be kept in the right solvent; under no circumstances should they be allowed to harden. Most brushes can be kept in turpentine. Shellac brushes are kept in alcohol. Brushes used for lacquering should be kept in lacquer thinner.

It rests with the instructor whether the container for the brushes shall be closed or open. Both methods have advantages. Brushes which can be kept in turpentine may be kept in open containers. For brushes kept in alcohol and lacquer reducer, some sort of closed receptacle should be provided. A tall can, as a cut-down varnish can, which will allow the entire brush to be enclosed, will do very well. Under no circumstances should the brush be kept in the same can with the finishing material; neither should it ever be laid across the top of the can, where it will harden.

For brushes to be kept in turpentine a good method is to secure a can of a size that will be just a bit larger than the brush it is to hold. There will not be enough solvent evaporate in the run of a day to warrant having the brushes closed up all of the time when they are not in use.

Just because a brush can be kept in turpentine does not mean, however, that all such brushes can be kept in the same container indiscriminately. This has been done, but never with good results. Brushes for one kind of job should be kept in one can, and those for another kind of job in another can. This may add to the number of cans required, and increase the amount of solvent used, but the better results obtained warrant this practice. If brushes are not to be used for several days or more, they are to be cleaned thoroughly in the proper solvent, washed in soap and water, dried, and laid away.

Still another point about brushes is that they are not to be set down in the solvent so that they rest on the bottom of the container. Some sort of wire should be fastened across the can, and a bent nail or hook put on the brush, so that the brush can be hung up, allowing the bristles to rest in the solvent, but not to touch the bottom of the can. When a brush is allowed to lean, the bristles become bent out of shape, making it more difficult to use. Also, some of the finishing materials will collect at the bottom of the brush container, so that if the bristles are permitted to rest on the bottom, this sediment will clog them up right where the most damage will result. This gives rise to one of the commonest causes of poor painting and varnishing. These particles will stick to the bristles, harden, and then come off as grit, marring the work. An ideal arrangement would be to have each brush perfectly clean before attempting to use it. Every effort should be made to approximate this condition; a new brush paints clean.

Another adjunct to the finishing bench is a small jar of turpentine and a supply of rags, so that spilled finishing materials can be cleaned up, and so that pupils may clean off their hands after completing a finishing job.

At the close of each period, the instructor should check up on the condition of the finishing room. In most cases this duty can be delegated to a reliable pupil. In a short time definite habits can be established, so that the finishing room will always be kept in an orderly and tidy fashion. At the close of each day, the instructor should go over all finishing materials replenishing the supply here, cleaning a brush there, and seeing that everything is in perfect condition. If the room always is clean and tidy when the pupils enter it, they will be much more likely to take a pride in trying to keep the room at its best at all times. Most assuredly there is no excuse for a splotchy, splashy-looking finishing room, such as can be seen in some schools.

The last problem to be considered is that of instruction sheets and signs. Pupils will be certain to forget most verbal instructions; and to make endless repetition unnecessary, a good plan is to mount in a conspicuous place some sheets of instructions which are to be adhered to in the finishing room. Much care should be exercised in preparing these sheets. Perhaps the first set will need revision almost at once. What a pupil should find on such sheets are immediate, concise answers to whatever questions might arise. Such matters as care of brushes, kinds of solvents, how to apply different finishes, should be treated. All statements should be brief and to the point; statements should be systematically arranged so that any topic can be readily found and studied. Before posting such instructions, the instructor should go over them carefully in class, to make sure that each statement is fully understood. Pupils should then be held to strict adherence to the directions laid down.

The matter of signs is of some importance also. Signs are helpful, if they are few, and timely. Thus on the doors might be put an admonition to keep all doors closed. Near the shelving should be a sign to remind pupils to put work up on high, and not to put work above a newly finished piece. The following signs have been found helpful, when placed above the finishing bench:

"Let's keep our finishing room always looking clean."

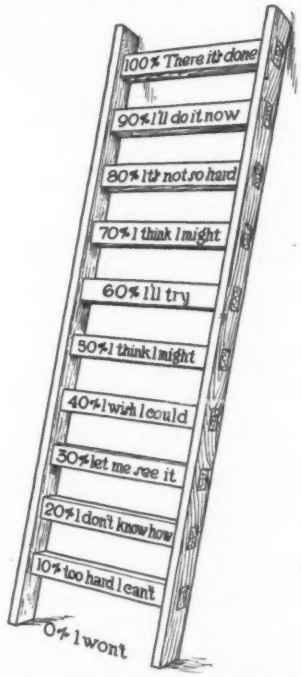
"Keep all finishing materials sealed air-tight."

"Keep all brushes HUNG in their proper container."

"Be economical; finishes are expensive."

"People will judge your work largely by the finish you give it."

A final injunction is not amiss. The fittings of the finishing room should be metal so far as possible, and every precaution should be taken to guard against fire. The local regulations in each community will limit the amount of inflammable materials which may be stored, and will prescribe the types of containers which may be used. It is desirable that every instructor familiarize himself with the local regulations, invite inspection on the part of the fire department, and cooperate in every way to reduce hazards. There is here an opportunity for teaching safety, correct trade practice, and law observance.


100% There it's done
90% I'll do it now
80% It's not so hard
70% I think I might
60% I'll try
50% I think I might
40% I wish I could
30% let me see it
20% I don't know how
10% too hard I can't
0% I wont

THE LADDER OF SUCCESS IN SHOPWORK.
—By J. McSweeny, The Dudley School, Boston, Mass.

GUARDING THE MACHINERY IN SCHOOL SHOPS

G. E. Irons, Bureau of Standards, Board of Education, Cleveland, O.

Standards were recently adopted in Cleveland, covering the important details of the guarding of machinery in school shops.

Although the safety codes of the various states differ in many respects, it is felt that the principles outlined in these Cleveland standards may be of interest and value to other school systems, all of which must face this problem in greater or less degree.

It should be noted that the provisions of the Ohio Safety Code cover many things besides machinery in school shops. These standards, on the other hand, deal only with the machinery hazards which do, or may, exist in school shops. They amplify the state codes in such detail as is necessary to assure thoroughly practical, dependable and durable safeguards.

Particular attention is called to the method used in solving the practical problem of securing accomplishment of necessary safety work, with limited funds available.

The more dangerous conditions are designated "major hazards," and the standards stipulate (section I) that these "major hazards" shall be obviated first, leaving the less dangerous conditions, or "minor hazards," for later consideration.

The best industrial practice, as reflected in several up-to-date plants and in literature on the subject, the recommendations of the National Safety Council through its bulletins, the cooperation of the local Safety Council through its Committee on Standards, and the opinions of teachers and supervisors of shop work—all of these were taken into account in the preparation of these standards, and acknowledgment is made of our indebtedness to each of these sources.

The standards follow:

Sec. I. General Safety Standards for Workshops and Factories

As required by law, the "General Safety Standards for Workshops and Factories" (see copy attached), as issued by the Industrial Commission of Ohio, January 1, 1924, shall be followed in constructing and equipping new school buildings within the City School District of Cleveland. Wherever safety hazards exist in old buildings, they shall be removed in accordance with the general code as hereinafter specified, and as rapidly as budget funds will permit, the major hazards being eliminated first. Certain designations will be made hereinafter as to which hazards may be considered major and which minor.

The main headings of the "General Safety Code" are as follows:

Section
1. Standard Railings
2. Standard Toe Boards
3. Elevated Runways and Platforms
4. Stairs
5. Floor Openings
6. Wall Openings
7. Set or Train of Gears
8. Clutch or Coupling
9. Vertical and Inclined Belts
10. Horizontal Belts
11. Rope or Chain Drives
12. Belt Clearance
13. Revolving Shafting
14. Keys, Set Screws
15. Machinery Control
16. Flywheels
17. Ladders
18. Boiler Walks
19. Counterweights

Sec. II. Specific Safety Codes

The additional specific requirements of the Industrial Commission of Ohio, as to metal and woodworking machinery, grinding wheels, foundry equipment, and other shop equipment (issued in separate bulletin form, under date of January 1, 1924) shall be observed throughout the Cleveland School System. Where acceptable safeguards are not already provided, they shall be provided as rapidly as budget funds will permit, the major hazards being eliminated first. Certain designations will be made as to which hazards may be considered major and which minor.

The following specifications are intended to amplify the general codes and to define them in terms applicable to school shops.

Sec. III. Standard Materials for Construction of Guards for Machinery

(A) Wire-mesh guards for belts and pulleys, and for all general guarding which does not call for railings or sheet-metal guards, as specified, shall be constructed from the following materials:

(1) *Framework.* Minimum dimensions of materials for the framework of all guards, except as noted in the following paragraph, shall be angle iron, 1″ x 1″ x ⅛″.

Guards 30″, or less, in height and of a total surface area not in excess of 10 sq. ft. shall have a framework of ¾″x¾″x⅛″ angle iron. Belt guards having a total surface area of less than 3 sq. ft. shall be constructed of sheet iron. (See Section III-A-3.)

Wherever it is necessary to provide doors in guards, framework of such doors shall be constructed of ¾″ x ¾″ x ⅛″ angle iron, provided the surface area of the door is not greater than 3 sq. ft.; should the area be greater than 3 sq. ft. the framework of the door shall be constructed of 1″x1″x⅛″ angle iron.

(2) *Wire-Mesh Filling Material.* Wire mesh, size .072 in., galvanized after weaving, and having either "2 meshes to the inch" or "one-half inch mesh" shall be used exclusively as the filling material.

(3) *Sheet Iron.* For the purpose of enclosing end gears on lathes, and all other gears, chain drives, couplings or clutches which are integral parts of machines and are exposed to contact; for housing shafts; and for constructing small belt guards of which the total surface area is less than 3 sq. ft., sheet iron shall be used. In the majority of cases, No. 16 U. S. Std. gauge iron shall be used, and the *Commissioner of Housing shall determine the requirement in each case to give safe, rigid guards, provided only that no sheet metal guard whatsoever shall be constructed of metal lighter than No. 20 U. S. Std. gauge.

Exceptions: In all cases where solid guards are provided with the machines when purchased, and such guards are in the form of castings, or differ in other ways from these requirements, such guards shall be acceptable if they are sufficiently safe and rigid in the opinion of the Commissioner of Housing. This does not apply to wire-mesh guards, however, which must conform in all cases to these specifications. (See Section IV—A.)

Sec. IV. Method of Construction and Fabrication of Guards for Machinery

(A) Wire-mesh Guards

(1) *Frame Construction.* The construction shall be by cold riveting throughout, ⅜″ soft iron rivets being used, as shown on the attached standard detail No. 701. Triangular gusset plates of ⅛″ iron, and measuring approximately 4″ x 4″ x 5¾″ shall be used for stiffening the corners wherever necessary to give a rigid construction satisfactory to the Commissioner of Housing.

General Details:

Whenever any one area of wire mesh is greater than 8 sq. ft., at least one cross brace of 1″ x ⅞″, or 1¼″ x ⅛″ bar iron shall be used; the location and use of such braces shall be approved by the Commissioner of Housing.

All guard doors whose vertical dimensions are greater than 4 ft. or which have a surface area in excess of 8 sq. ft. and which are hinged to the main framework, shall be hinged with not less than three No. 10 butt hinges, with tight pins; smaller doors shall have only two hinges.

In special cases where it is impossible to use a hinged door, and only in such cases, the guard doors shall rest in metal clips, being latched at two points.

Wherever belt guards are required in addition to cone-pulley belt shifters, the belt guard shall be so constructed as to permit operation of the belt shifter without opening the guard. This requirement necessitates a slot in the belt guard for the lower shifter handle.

Latches shall be constructed of ⅛″ x ¾″ or heavier bar iron and shall not project beyond the framework of the guard. The handle of the latch shall be riveted to the door or, if bolted, shall be provided with a lock nut to prevent handle from working loose under vibration.

(2) *Attachment of Wire Mesh.* Wire mesh shall be attached to the angle iron by means of a continuous ¾″ strip of No. 14 U. S. Std. gauge sheet metal, which shall be riveted through the wire mesh to the angle iron, rivets to be ⅜″ soft iron rivets, *spaced not more than 6″ apart.* The use of "tabs" or washers of sheet iron, instead of the continuous strip of sheet metal, shall not be permitted. Where gusset plates are used, the wire mesh shall be placed between the gusset plates and the angle iron.

(3) *Attachment to Floor or Machine.* The guards shall be securely fastened to the machines with fastenings strong enough and sufficient in number to give a permanently substantial and rigid guard. Wherever practicable, the guards shall be fastened entirely to the machines; but when the vertical frame members are carried down to the floor for support, each member shall be attached to the floor as shown on standard detail No. 701, using adjustable feet as shown, and fastening each foot with *two* ½″ lag screws or expansion bolts as the floor may require.

As a general rule, an open space shall be left under guard frames for cleanliness, the distance from floor to underside of frame to be six (6″) inches. When machines are ordered from the manufacturer with belt guards attached, such belt guards must be in accordance with these specifications.

(B) Sheet-metal Guards

(1) *Frame Construction.* Sheet-metal guards, when constructed from No. 20 gauge galvanized sheet metal, shall be fabricated by the so-called "Pittsburgh lock" method; when heavier gauges of metal are used, acetylene welding shall be resorted to in order that guards shall be substantial and not subject to rattling in service. When welding is to be done, black sheet iron must be used to get satisfactory results. These guards shall be rigidly attached or hinged to the machines of which they are a part, and if hinged, shall be provided with approved latches. Large sheet-metal guards shall be reinforced with band iron or angle iron when this is necessary to insure rigidity.

Sheet-metal guards shall also be kept off the floor at least six inches, except in cases where moving parts require a guard closer to the floor.

(C) Standard Railings

The materials and construction specified in Section 1 of "General Safety Standards for Workshops and Factories" shall be provided when standard railings are required.

(Excerpts from Section I—Standard Railings):

"a. Standard railings shall be not less than 42 inches in height, and shall be provided with an intermediate rail between top rail and floor.

"b. If pipe is used in the construction, it shall be not less than one and one-fourth (1¼″) inch standard gauge pipe.

*The Commissioner of the Division of Housing is responsible for all Architectural and Maintenance work, and for the physical operation of school buildings.

"g. Posts or uprights shall be spaced not more than eight (8') feet apart."

(Excerpt from Section 2—Standard Toe Boards):

"a. Standard toe boards shall be not less than 4" net in height, of wood, metal, or other material."

Whenever standard railings are used to guard moving machinery, the code requires such railings to be placed not less than 15" and not more than 20" away from the moving parts. Special circumstances may occasionally arise when this provision cannot be observed, and railings must be placed closer to the machine to be guarded.

The use of safety railings in preference to wire-screen guards shall be subject to agreement between the Commissioner of Housing and the Supervisor of Vocational and Practical-Arts Education, in so far as educational equipment is concerned.

(D) Painting of Guards

The galvanized wire mesh does not require painting, nor will the galvanized sheet-metal guards of No. 20 gauge galvanized iron. The angle-iron frames and the black sheet-iron guards shall be painted, color to be specified by the Commissioner of Housing, with the agreement and approval of the Supervisor of Vocational and Practical-Arts Education.

(E) Existing Guards

Any guards already in service which meet the code requirements as to safety, in the opinion of the Commissioner of Housing or his designated representative, but which differ in construction from the standards set, shall continue in service until replacement becomes advisable in the judgment of the Commissioner. When replacements are made, these standards shall be followed.

Sec. V. General Rules for Belt Guarding

The following discussion covers the outstanding code requirements as to belt guarding. Certain other more specific details are covered hereinafter, and reference to the various specific state codes should be had on any point not covered in these standards.

All exposed belting shall be guarded with standard belt guards to a height of 6' from the floor, unless it can be shown to the satisfaction of the Director of Schools that certain belts are too small to be dangerous and that covering same will materially interfere with the operation of the machine. Belt guards shall be so designed and applied as not to interfere with proper operation of any machine, and doors shall be provided in guards wherever required to permit changing belts, oiling bearings, and making adjustments.

(Note: As will be mentioned hereafter (See VIII-D-1), belt shifters are acceptable in lieu of belt guards in certain instances where all parts of cone pulleys are 3' 6" or more above ground. In these standards this exception to the general rule is taken advantage of only in the case of the small types of metal and woodworking lathes.)

For all overhead belting, all parts of which are higher than 6' above the floor, there is no guarding requirement in the general safety code. The following rule is generally accepted as reasonable for the guarding of such belts.

"Heavy or fast running belts, so located that, should they break, they would endanger persons below, should be guarded underneath under these conditions:

1. If running at a speed of 1,800 feet or more per minute, and
2. If center to center distance between pulleys is 10 feet or more, and
3. If belt is 6 inches wide or wider.

In such cases the guard shall be approximately one fourth wider than the belt, and shall extend up around the pulleys to a line horizontal with the top of pulley, or to the ceiling if this is practicable. (If this is not done, a breaking belt may whip the entire guard down upon those beneath.)

Such overhead belt guards shall be of standard wire-mesh construction as specified, and shall be attached to ceiling or supports very rigidly with 1½" angle iron. The structure must be strong enough to resist the momentum of a flying belt in case it should not ride smoothly in the guard.

Other overhead belts which do not require guarding underneath, but which are near balconies, or otherwise easily accessible, shall be adequately guarded on the dangerous side.

In electrical laboratories where experimental hook-ups of motors, etc., are frequently changed, it is not always possible to observe the requirements for the guarding of belts. In these instances, consideration shall be given to the installation of standard railings with wire-mesh inserts when necessary, in such locations as will obviate the major hazards. Such arrangements should have the full understanding and approval of the Supervisor of Vocational and Practical Arts Education.

Attention is called to Section 12 of the general safety code, relative to belt clearance between pulleys and hangers.

All belting exposed to contact shall be considered as a major hazard, excepting belts 1" or less in width, which latter shall be deemed minor hazards provided no metal or wire fastenings are used.

(To be Concluded in the April issue.)

JUNIOR HIGH SCHOOL MANUAL ARTS

W. W. Scott, Topeka, Kansas

THE shops in the junior high schools of Topeka, Kansas, are being developed as basic industry shops. Each shop is equipped with woodworking tools for a class of 20 pupils, and in addition tools for elementary sheet-metal, electrical, and concrete work are provided for groups of 6 or 8 pupils. A separate drafting room is equipped for classes of 24 pupils.

Woodworking is taught in the fifth, sixth and ninth grades, home-mechanics problems in wood in the seventh B, concrete work in the seventh A, metal work, electrical work, and plumbing repair in the eighth grade, and mechanical drawing in the ninth grade.

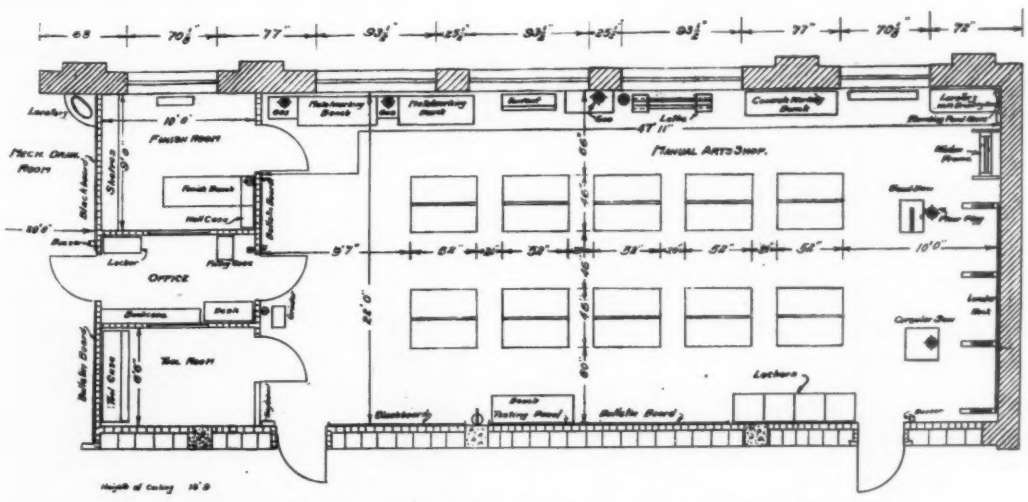
The woodworking equipment consists of the common bench tools, an adequate assortment of general tools which are kept in toolroom and the following power machines: turning lathe, an oilstone grinder, a portable variety saw, and a portable band saw.

Metal-working benches with machinists' vises and gas soldering furnaces are provided for sheet-metal work. An electrical testing panel with 110-volt and 8-volt currents enables the pupil to test the wiring problems which he works out on the wiring panels.

The plumbing panel consists of a number of the more common types of valves and faucets connected together and mounted on the wall above the sink, in such a way that they may be tested by connecting a short length of hose to a faucet of the sink. This enables the pupil to repair the valve or faucet and test his work with the city water pressure.

A concrete bench with a galvanized-iron top and with tilting bins for cement, plaster of paris and sand and with locker space for tools is part of the equipment for concrete work.

A window frame with 12-light sash provides practice in glazing, adjusting weights, hanging shades and making screens. Well equipped toolrooms and finishing rooms contribute to the efficiency of the shops.



MANUAL ARTS SHOP AT THE NORTH TOPEKA JUNIOR HIGH SCHOOL, TOPEKA, KANS.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

THERMOELECTRIC SIGN FLASHERS

Geo. H. Wichman, Coleraine, Minn.

Industrial departments of schools are frequently requested to aid in advertising numerous forms of school activities such as athletics, plays, exhibits, etc. The sign flashers described were designed to meet such a need.

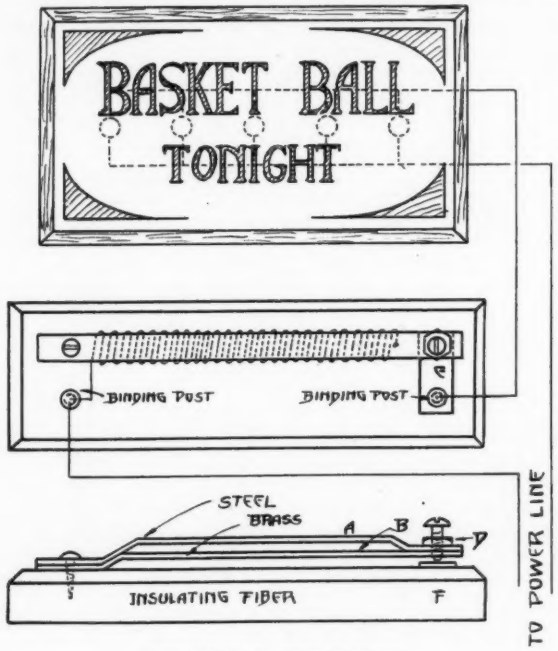
Happily the construction of a sign and flasher offers an interesting project in drawing, woodworking, and electrical classes. In this respect it satisfies numerous educational tests in that it involves definite physical and electrical principles; it offers a definite problem in mechanical and electrical calculation, construction and design; it requires a minimum of materials and time; it is practical and useful; it holds the interest of the students; and finally the results are certain.

The flashers constructed were of the on-and-off type and their action is dependent on the expansion of metals when heated. A brief examination of the wiring diagram shown in the drawing will make their operation clear. In each case the heating element connected in series with the lamps causes the metal strip to expand, thus opening the circuit at the contact points. As the metal cools the points are again closed and the operation repeated. Rapidity of flashes may be regulated to about one flash every one, two, or three seconds.

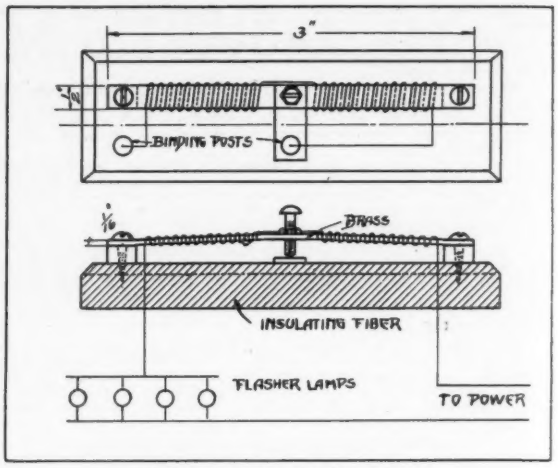
This rate of flashing is determined by the rate of cooling of the metal strip and also by the amount of heat produced in the heating coil. Each flasher must, therefore, be designed for a given current load: i.e., a flasher designed for a 50-watt lamp would fail to operate on a 25-watt lamp and would probably be ruined by using a 100-watt lamp. If rapid flashing is desired, the metal expansion strip should be made as thin as possible, allowing rapid heating and cooling. Copper wire, either cotton covered or enameled, makes a satisfactory heating element; care, however, should be exercised to keep the heating element insulated from the expansion strip. The size of wire to be used depends on the load carried by the flasher. The following table will give the approximate load carried by various sizes of copper wire:

Size Wire B & S	40	38	36	34	32	30	28
Flasher Load Watts	50	80	120	200	300	500	800

On account of intensive arcing this type of flasher is impractical when used on direct current power. With alternating current the flasher will withstand a load of at least 800 watts.



DETAILS OF A SIGN FLASHER.



DETAILS OF A SIGN FLASHER.

BULB BOWLS

D. K. Ingman, Douglas, Ariz.

Wooden bulb bowls and ash trays with metal liners offer a wide variety of tool processes, encourage original design, and furnish an unusually attractive and novel sample of shop products.

Boys taking the regular course in wood turning soon exhaust the home demand for the ordinary nut bowls, card trays, etc., and the bowls having removable copper or brass liners greatly increase the possibilities of such work. With careful instruction as to the general principles, and suggestions as to the best designs, each boy may be required to design and work out his own particular project.

As the majority of school shops have no special equipment for working sheet metal this discussion is confined to the use of such tools and materials as can be provided in almost all shops. The metal liner is made first, then the bowl or tray is turned to fit it. For bulb bowls the liner should be about 2" deep, 5½" in diameter at the top, and 3½" in diameter at the bottom.

BOWLS AND CUPS FOR BULBS.

A form for use in shaping the metal is turned from a piece of maple about 3″ thick and 8″ in diameter. In this piece turn a depression 2″ deep, 5⅜″ in diameter at the top and 3⅜″ at the bottom, the walls being a straight line. Leave the form on the face plate to give it more weight and so that it may more easily be held in the vise.

From sheet copper or brass of 14 to 16 gauge cut a disk about ⅜″ greater in diameter than the liner is to be when finished. Anneal by heating to a cherry red and quenching in water. With light blows from the ball of a ballpeen hammer force the sheet metal into the form, leaving the edges rough as cut. Care must be taken to distribute the hammer blows evenly over the surface in order that the metal will not be strained to the breaking point.

If after much hammering, the metal becomes hard and brittle, it should again be annealed, and the shaping process continued as before.

It is not necessary that the metal be made to take the exact shape of the form at the bottom, the corner may be left more nearly quarter round, but a turned form is desirable as a true circular shape for the sides is more easily obtained.

The next step is to make the bowl to receive the liner. The piece to be turned should be glued to a piece of 1″ pine stock with a sheet of paper between. The face plate is then screwed to the pine, and after the work is finished, the paper may be split and the block removed, leaving no screw holes in the finished piece.

With a round nose chisel hollow out the bowl to a size such that it may be used as a chuck for finishing the metal liner. Drive the liner into this chuck with light blows of the hammer, taking care to make it run as true as possible. With the motor at low speed, dress the edges of the metal with a file, and polish the inside of the liner with emery cloth or sand paper.

The metal liner is now finished and the turning of the bowl to receive it may be completed, and the outside shaped to suit the fancy. The liner should fit loosely enough to be easily removed.

After stain and filler, a French polish is applied with the work in the lathe.

METAL WORK IN MANUAL ARTS

Emerson W. Manzer, Madison, Wis.

Contacts with present-day industries and the numerous occupations that grow out of them, will broaden the minds of boys who take the work in the manual-arts departments.

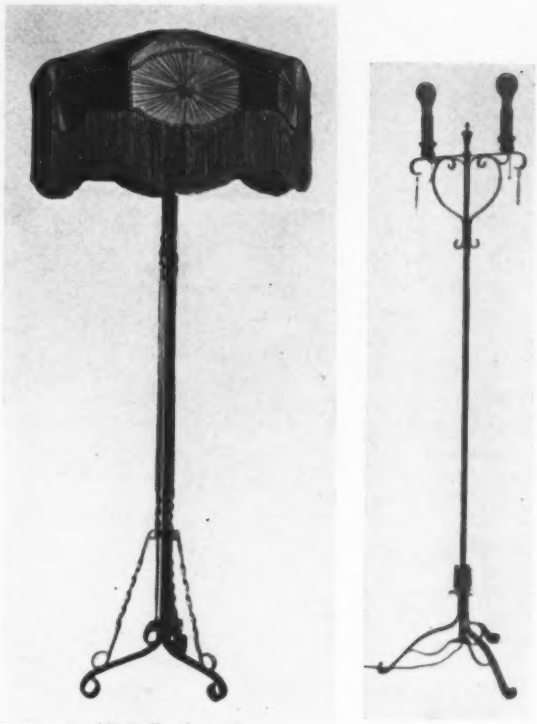


FIGURE 1.

Their radius of technical knowledge will increase with every shop visit and with every opportunity to deal with materials other than wood. If we desire to cultivate in the boy an appreciation for labor, we must do so through the combination of observation and participation. It is quite true that we learn by doing, but observation makes doing much easier. In a recent visit to the Buck Stove Company many operations were brought before the eyes of a group of boys. The one of most interest was molding. Our school shop was about to take up this phase of industrial work and the interest manifested by the boys at the shop was very noticeable. A desire to do molding was created and as soon as we got back to the school shop many of the boys had "dibs" on the jobs. Observation and then participation was worth very much to these boys.

FIGURE 2. SUGGESTIONS FOR FLOOR LAMPS.

The introduction of other types of work other than woodwork, with its cut-and-dried projects that "keep the home fires burning," will vitalize the shop and create an interest that cannot do other than leave a residue of valuable information after the work has been done and the experience gained. Metal work, with its broad related field, affords an opportunity that cannot be overlooked if we are to give industrial intelligence to boys who come to us for broadening courses. In a recent report, William E. Roberts said: "Metal work gives an added medium of expression in the manual arts. The properties of metal present new problems, experiences, sensations, difficulties, and reactions. The 'feel' of metal is in marked contrast with that of wood, and the reactions of the various metals to tools are characteristically different. Metal work, of all the industrial activities, provides the best medium for concrete applications of mathematics, particularly of geometry. Some of the minor processes are economic factors in the lives of all."

Many interesting as well as educational articles can be made from sheet metal or from poured metal. Antique wall sconces, writing-desk sets, calendar mounts, hammered trays or book ends, serving trays, are a few suggestions. In the foundry, metal may be used for book ends, incense burners, bases for smoking stands or floor lamps, parts for art-metal lamps or patterns for toys. The possibilities are many and boys enjoy the pleasure of making something real to take home for commendation.

A simple course in metal work is very easy to inaugurate in the regular manual-arts shop. Very little extra equipment is needed and the amount of related matter on metals is unlimited. Slides, written topics, motion pictures, excursions, and other mediums are at the command of every teacher. The results of an eighteen-week course tried out at the Wisconsin high school of the University of Wisconsin are most gratifying. Floor lamps, smoking stands, bird stands, book ends were expressions of the possibilities of metal work in the junior and senior manual-arts classes. Figure I shows a wrought iron lamp made by a student in the senior high school. The smoking stands and bird-cage standards were made by junior-high students. Examples of floor-lamp designs are shown in Fig. 2. In the picture of the smoking stands, Fig. 3, the related activities are pointed out.

The following equipment will be found quite adequate for doing similar work:

75	pounds of ⅛" x ¾" strap iron	$ 2.00
25	pounds of ⅛" x ½" strap iron	1.00
2	gross ¼" 10/24 machine screws	.50
1	pound rivets	.20
3	4-pound ball peen hammers	3.00
6	No. 23 twist drills	.85
3	No. 10/24 taps	1.20
12	Hack-saw blades	1.00
12	Sheets emery cloth	.40
3	Center punches	.75
2	Hand drills	6.00
3	Hack-saw frames	3.00
6	Files flat bastard	2.00
1	Tap wrench	1.00
2	Machinist vises	8.00
	Estimated Total	$30.90

The pipe for the posts may be purchased from any plumbing shop, or it may be secured from some old scrap pile. It is advisable to use small pipe.

When parts of the lamps have been completed the introduction of the electroplating process will interest the boys and make up a better looking job. In most cases, however, the plain iron may be cleaned with the emery cloth and then given a coat of lacquer as a protecting coat. The experiences are so numerous and the sensations so vital that it seems quite necessary to include metal work in the manual-arts curriculum.

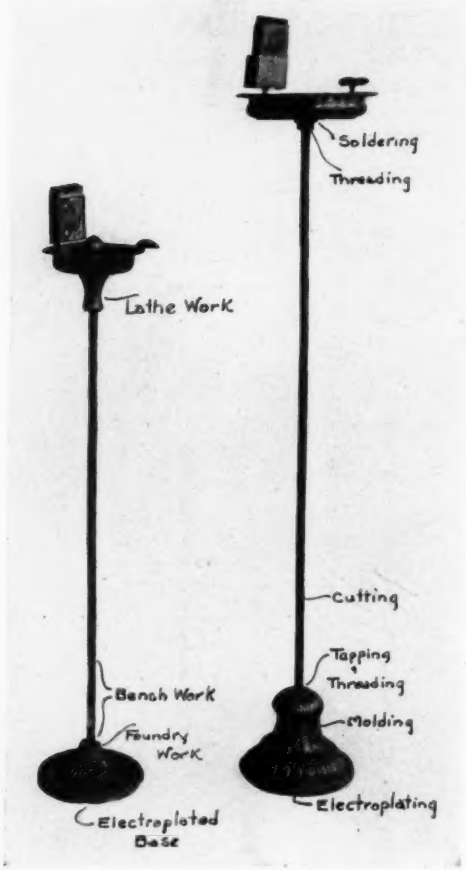


FIGURE 3.

AN EXCELLENT PROJECT FOR SPECIAL-CLASS BOYS

A. K. Eccles, New Brunswick, N. J.

The writer has been called upon during the past three years to provide handwork for mentally defective and incorrigible boys between the ages of 12 and 16. Boys of this age in the course of the school year can work up a vast amount of material if they are kept busy. Hence, it was necessary to find projects that were at once easy for boys of this type to carry out well, readily sold to the public to reimburse the school for material, and sufficiently rich in the variety of operations to be of value as media for training.

A Fernery

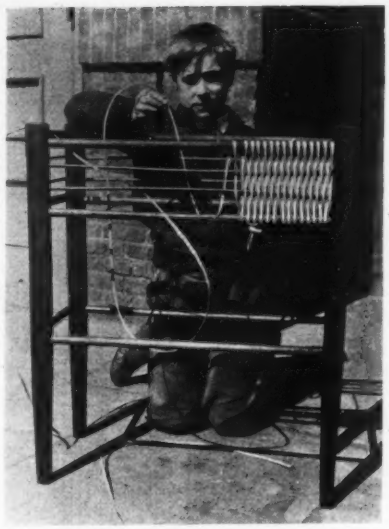
One of the best of these projects has proven to be a fernery. This fernery has a wooden frame, reed sides, and a sheet-iron soil container. This has been found to make an excellent individual project, or a community project, in which boys of different grades of ability do the various parts of the work, even to acting as salesmen. A description of the parts is as follows:

The Frame: Four legs, chamfered at the top and tapered toward the floor, made of any kind of cheap, fairly clear wood. These are 30" long by 1¼" square; six ¾"x9" dowels; four ¼"x25" dowels; four ¼"x10" dowels.

The Sides: Quarter-inch, white, flat reed, woven vertically over-one under-one continuously around the frame.

The Container: A rectangular box of 28 gauge galvanized iron 24" long, 9" wide, and 6" deep.

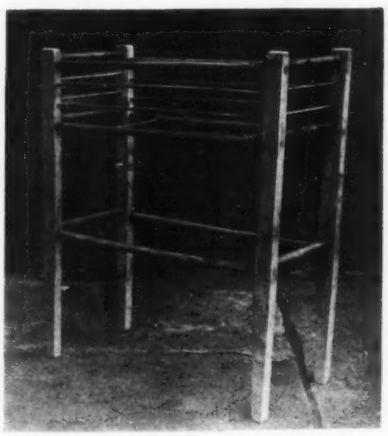
Construction of the Legs: The preparation of the parts is as follows: Get stock for the legs that will not need much dressing down to thickness and width, as very few boys of this type can square up stock. After the legs are cut to length they must be planed just enough to get the machine marks off. Then the chamfer and the taper are made. To get the lines for the taper, a sheet-iron or wood pattern should be made by the teacher and used by the boys.



THE PROJECT UNDER CONSTRUCTION.

Now the screw and dowel holes are located and bored. The trick in making the fernery stand square, when it is put together is to screw the legs onto the ends of the dowels, instead of making the dowels fit into holes in the legs. Very few boys in special classes can bore holes straight enough to make the dowels enter them squarely. By the use of 2" No. 12 flat head screws, however, enough flexibility, without sacrifice of strength is secured to twist the frame into square-standing shape. The screw hole locations should be indicated on the pattern above mentioned, so that the boys have only to stick their pencils through the holes when the pattern rests on the leg. Measuring from the top the first hole, ¼" diameter, should be 1", the next, 6" below that, and a third one 12" below that.

Now bore the holes. Next lay the four legs on the bench all the tops at one end, and the holes already bored parallel with the bench top. Now lay the pattern on the legs again and mark the second series of holes on the surfaces now turned upward. Measuring from the top, these will be 1½", the next 6" below that, and the last 12" below that. This arrangement of holes allows the screws to pass one another. Now the four legs will have to be grouped as they will stand when assembled and the outer two faces of each leg marked. The holes on these marked faces must be countersunk ½". Next, the legs are again laid on the bench with the four faces having no countersunk holes turned up. Marks are now made to locate the holes into which the ¼" dowels are later to be fitted. These marks are made 2" and 4" below the top screw holes. Turn the legs until the other four faces are up that have no countersunk holes and as before, measure 2" and 4" below the top screw hole. These holes now located are to be a little over ¼" in diameter, to allow a little play and are to be ½" deep. It is understood that all these holes are on the center line of each face. Now the legs are ready for a thorough sanding.



THE FRAME READY FOR THE WEAVING.

Next, all the ¾" dowels are to have holes bored with a No. 4 gimlet bit into the centers of their two ends. The holes are to be as deep as the bit will make them. In making these gimlet holes it is wise to withdraw the bit frequently to prevent heating and breaking the bit.

Assembling the Pieces: Assembly is now in order and care must be taken to get the legs in their right relationships. Have the boys soap the screws or drop oil into the holes in the dowels before they begin to screw the legs onto the dowels. If this is not done, broken screws, blistered hands, or split dowels will result. The legs and the ¾" dowels should be screwed together loosely at first, the ¼" dowels can be dropped into the holes provided for them and then all the screws tightened up. Now provision must be made for supporting the container. This support consists of two 9-gauge wires, 10½" long, which are dropped into the two middle long ¾" dowels. Number four gimlet holes made 4" from the legs will hold these wires. The frame is now complete and should be twisted until it stands firm, and if necessary, the screws tightened further.

Now is the time to stain the frame. Before this is done, however, the countersunk screwheads should be puttied over.

Weaving the Sides: Having wet the reed, start next to any leg and weave over-one under-one, using the two ¾" dowels and the two ¼" dowels for weaving. Care must be taken to join the pieces of reed neatly. This is done by letting the two pieces overlap over and under the two ¼" dowels. When the reed is dry, the woodwork and the reed work should have two coats of varnish, care being taken to get the varnish worked well into the spaces of the woven work. In this connection, it is well to note that if the woven work is to be uncolored as in the present case, the woodwork should not be stained with an oil stain, otherwise during the varnishing the color will be dropped on the reed by the brush.

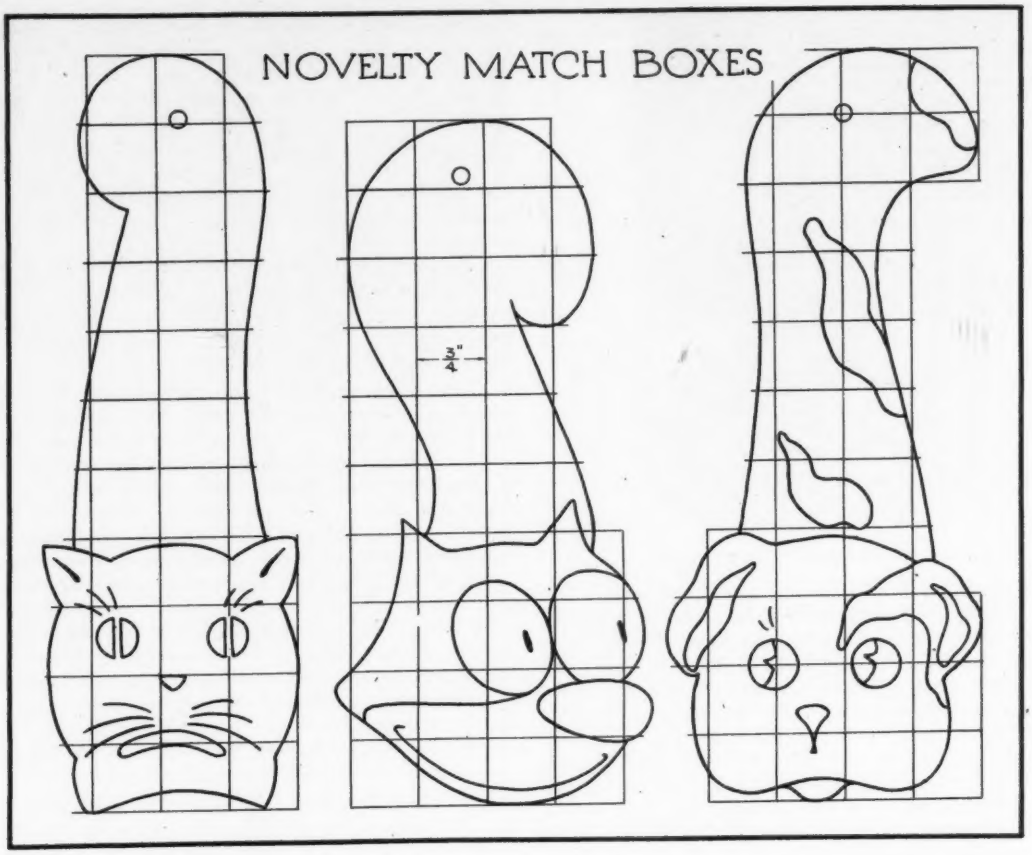
The Metal Container: To make this, start with a sheet 21"x36". The layout for a box of this kind need not be detailed here any further than to say that the corners should be lapped, and riveted near the top and bottom at each corner. The best rivets to be used are ¼"x⅛" flat-head aluminum. Boys of this type cannot rivet any too well and they get better results from an easily flattened rivet. When the box is shaped up and riveted, the outside joints are soldered, using wire solder. Test the box to see if it will hold water before placing it in the frame. The project is now complete. As a substitute for the metal container, a ½" board 20"x9", is often found satisfactory, since some people wish to set potted plants in these ferneries in place of using a box.

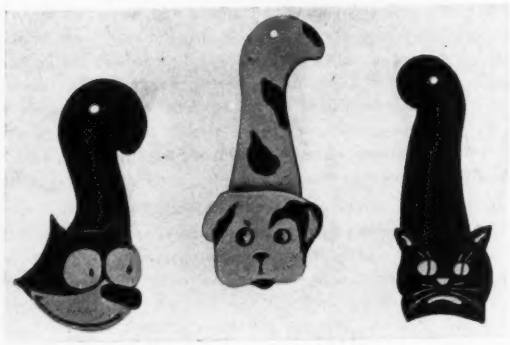
NOVELTY MATCH BOXES

J. W. Bollinger, Tulsa, Oklahoma

Since "time out of mind," match boxes have been made in each and every course in sheet metal work given in the public schools. To make a good match box is a good problem, but why stick to the same designs? Here is a novelty design, which will admit of even more variations than the three shown in the picture.

In each case, the matches are in a small pocket behind the head; the pattern is made with the tail and the parts for the pocket in one piece, and the head a separate piece. The head is soldered in place. The pupils work out their own





SHEET METAL MATCH SAFES.

pattern, using squared paper marked out as in the drawing. Original designs are to be encouraged. Sharp points should be avoided in the designs of fronts of the match pockets.

The superstitious cat is black all over with exception of the lines of the face; the same can be said for "Felix"; the puppy is white all over, except for the face and other markings,—his tongue is red.

WILD ANIMAL COAT HOOKS

Margaret Fullerton

That there is "A place for everything, and everything in its place" in a modern shipyard, automobile factory, or department store is evident from the quiet efficiency with which the business of each is conducted.

Mothers usually strive toward a similar goal in the running of the domestic machinery. The results of her efforts are likely to fall far short of the mother's ideal, although probably quite satisfactory to her small sons, who are, appar-

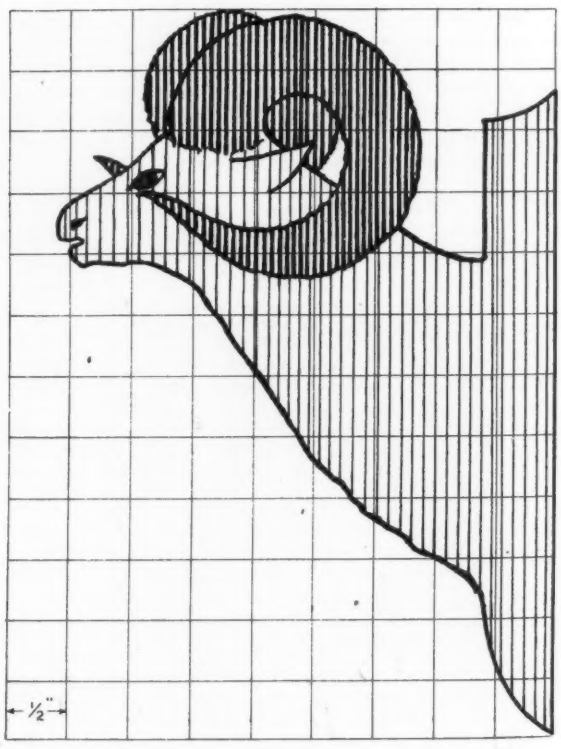


FIG. 3. BIG HORN SHEEP.

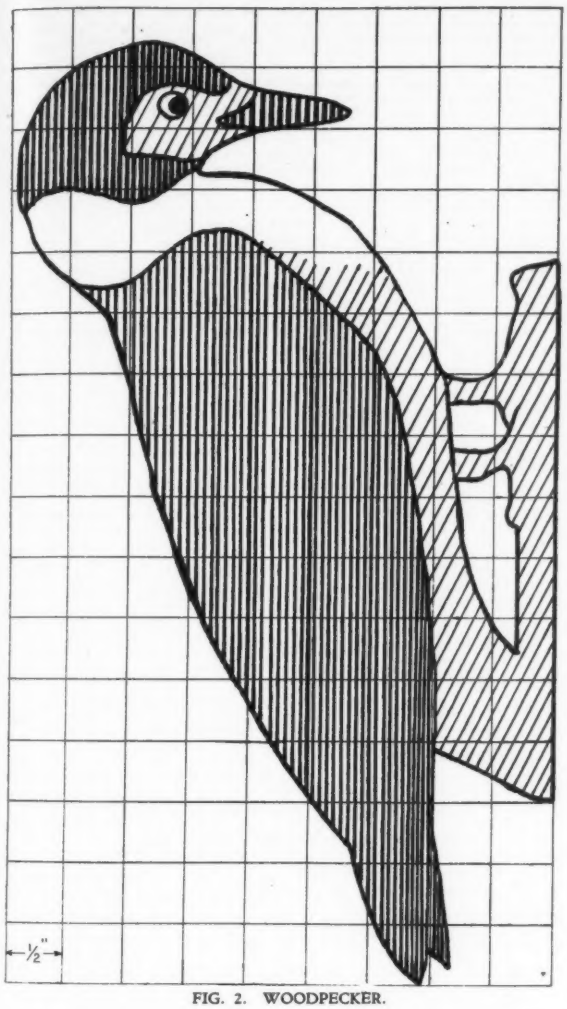


FIG. 2. WOODPECKER.

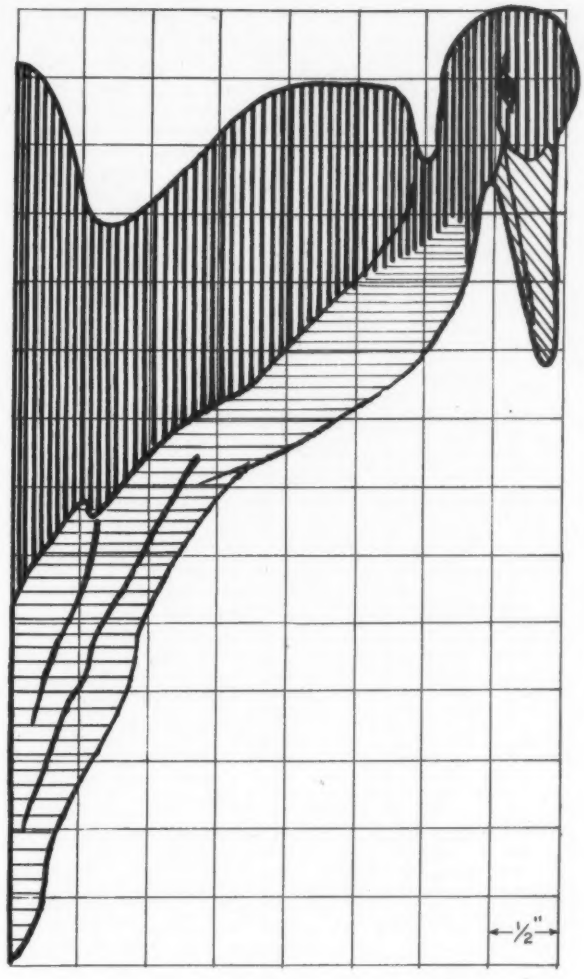


FIG. 4. STORK.

ently, constitutionally unable to understand the adult fetish called "ORDER." In like manner the exasperated mother who catches her son just in time to prevent his going to school with one black and one tan shoe is equally incapable of understanding "how he can be so careless," especially when she knows that he spends hours arranging his collection of postage stamps or flint arrowheads in mathematically exact order.

The space back of the wood box, under the davenport, or on top of the gas stove seems to the busy small boy as good a place to leave his cap as the hook mother insists it should be hung on. The accompanying drawings show a sort of coat and cap hook whose use can be made into a game sufficiently interesting to fix the habit of hanging articles in the same place every time, which is at least a step in the desired direction.

Animal and bird coat hooks are sawed from three-quarter inch hard wood boards, planed, sanded, and painted in appropriate colors. They may be mortised into the upright parts of a hall tree, or fastened to a horizontal board, or to the wall, by means of round headed blued or brass screws through parts provided for the purpose, as "A" and "B" in Figure 1.

It is suggested that each child be allowed to choose his own bird or animal, or as many different ones as necessary to accommodate the items to be cared for. Practically any bird or beast can be made to serve as the motif for a coat hook, care being used to strengthen the parts subject to strain; to cut it from the wood in such a way as to reduce the danger of its splitting with the grain to a minimum; and to leave projections at the top and at the bottom for the screws, if they are used, or for the tenons if the hook is to be mortised into hall tree posts.

For finishing it is best to use flat white enamel for the undercoats, and white enamel, tinted as required with artists' tube colors, for the colored parts. A coat of clear Valspar over all makes the most satisfactory final coat, as dirty finger marks can be washed from surfaces thus finished without damage to the paint beneath. Colored brushing lacquer makes a better finish than paint or varnish.

The designs shown in the drawings are offered merely as suggestions. Other birds and beasts which it has been found easy to adapt to this use include the moose, bison, horse, burro, elephant, jack rabbit, pelican, flying wild goose, dog, rhinoceros, and zebra. The deer, elk, and Rocky Mountain goat are not so satisfactory because their slender horns are too easily broken. If made thick enough to stand the rough use a child's coat hook is subjected to, the horns on such animals do not look enough like the real thing to appeal to a boy.

Explanation of the Drawings

Figure 1—Silver Grey Squirrel.
A. Location of upper screw.

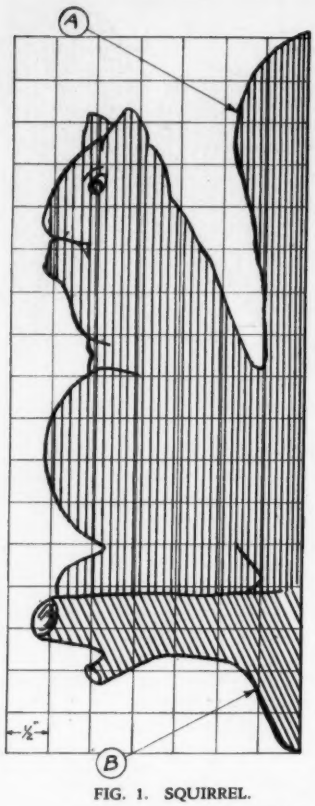


FIG. 1. SQUIRREL.

B. Location of lower screw.

The squirrel is painted silver grey, a little darker on his back than in front, with black eyes and black outlines defining his ears, legs, and chin. He is sitting on a darker grey or a brown pine limb.

Figure 2—The Woodpecker.

This woodpecker has a black coat, black cap, and black beak, which contrast very well with his red breast, red face, and white collar.

Figure 3—The Big Horn Sheep.

This is not the head of a live mountain sheep, but a mounted trophy such as successful sportsmen bring back from Alaska and British Columbia. The head and neck are white, with black eyes, black markings, dark brown horns and either a white shield or one the same color as the board the coat hook is to be fastened to.

Figure 4—The Stork.

The stork is black, with a yellow breast and orange beak.

UNIT INSTRUCTION IN ELECTRICITY

By H. S. Rich, Jamestown, N. Y.

The following material forms the basis of a unit-instruction sheet in electricity and takes up, as a means of introducing the subject, the history of electricity. The material is particularly suited for junior and senior high-school classes who are beginning the subject.

Unit-Instruction Sheet No. 1 Subject: Electric.
Topic: Brief History of Electricity.

OBJECTIVE:

A brief outline of the early knowledge of electricity, some of the prominent scientists, and the present-day achievements.

TOOLS:

MATERIALS:

Illustrations, photographs, or small models of the incandescent lamp, motor, generator, X-ray, telegraph, telephone, radio, electric furnace, searchlight, welder, movie projector, picture-transmitting apparatus, and other electrical inventions.

TRADE SCIENCE:

1. Electricity was discovered, not invented, and its actual substance is practically unknown.

2. One source of the word electricity is from the Egyptian word "elektron," and it was what the wise men of a Pharaoh discovered when a portion of amber was rubbed with silk; as small bits of straw, leaves, feathers, etc., were thereby attracted.

Such experiments were performed during the time of Thales of Miletus, 600 years B. C.

Today, we speak of that effect as static electricity, and we can build static machines having glass plates that are capable of producing long, high voltage sparks purely by friction.

3. Many scientific men in Europe years ago discovered important facts about electricity, and made many interesting and valuable experiments; such as Volta, the Italian; Faure and Ampere of France; Watt and Faraday of England; Ohm, Joule, Marconi, and others.

4. In America, Benjamin Franklin was one of our earliest scientists in the electrical field; and since then, the discovery of many electrical abilities and facts has been largely due to such far-sighted inventors as Edison, Bell, Brush, Crocker, Westinghouse, Tesla, Steinmetz, Morse, DeForest, and a few others.

5. The result is, that today, for all that we do not know what electricity is, we know how it acts, how it may be generated and controlled, measured, and made to perform many of its wonderful possibilities.

Thus, in this age we have:
A hydroelectric turbine generator at Niagara Falls of 70,000 horse power.
The electrical locomotive of from 2,000 to 5,000 horse power.
The nitrogen-tungsten lamp up to 1,500 candle power.
The mercury-vapor lamp.
Industrial motors up to 6,000 horse power.
The penetrating X-ray.
The far-reaching telephone.
The wireless and radio, one-third way round the world.
Reducing furnaces, melting tons of ore.
Searchlights, up to 450 million candle power.
Electrical arc-welding machines.
Transmission of pictures and writing over long distances.

6. The greatest electrical inventor in America is Thomas Alva Edison, born in Milan, Ohio, in 1847.

He holds about 3,000 patents, including the phonograph, incandescent lamp, magnetic ore separator, microphone, steel battery, multiple telegraph, fluoroscope, and many other useful inventions. Edison says, "The greatest inventions are yet to come."

7. Dr. C. P. Steinmetz, who was with the General Electric Company for years, made some wonderful improvements in the line of transformers, locomotives, insulators, lightning arresters, etc.

He came to this country a poor young man, but he had a splendid mathematical education.

TRADE TERMS:

Generator, turbine, tungsten lamp, mercury-vapor lamp, motor, X-ray, telegraph, telephone, wireless, radio, reducing furnace, searchlight, welder, picture transmitter.

TRADE MATHEMATICS:

TRADE SAFETY PRECAUTIONS:

Large generators, electric locomotives, large industrial motors, electric furnaces, and arc welders generally carry either high voltage or high amperage, and are thus more or less dangerous. Large, bright lights are very trying on the eyesight, and must be installed so as to be out of the line of vision.

Lightning is dangerously high voltage, and life and property should be properly protected.

DEMONSTRATIONS:

If a mercury-vapor lamp is procurable, its rays may be compared with the light of the incandescent lamp.
A small X-ray lamp can be lighted from an induction coil.
A telegraph key and sounder may be operated before the class.
A pair of telephones may be connected across the room.
A small wireless telegraph set may be operated.
A small welding transformer may be connected to 110-volt line.
A static machine may be operated.
A small motor may be run from battery cells.

SUMMARY:

The idea of many of the modern electrical inventions really originated with scientists 75 to 100 years ago, and since then have been developed to a very useful degree.

Much of modern industry depends more or less on electrical apparatus and conveniences.

TEST:

1. Did anyone invent electricity?
2. What does early history say about electricity?
3. Name some of the early European scientists.
4. Name some of the electrical inventors of America.
5. Where is one of the largest generators in this country?
6. What other lamp is there beside the incandescent lamp?
7. How large are motors made?
8. What does the X-ray do?
9. How far has wireless reached?
10. Of what use is the telephone?
11. To where is it possible to telegraph?
12. Where are searchlights used?
13. Did you ever see an arc welder on the trolley road? What was it being used for?

ASSIGNMENT:

For the next session, write 200 words on Thomas A. Edison, and 100 words on C. P. Steinmetz. Refer to library books.

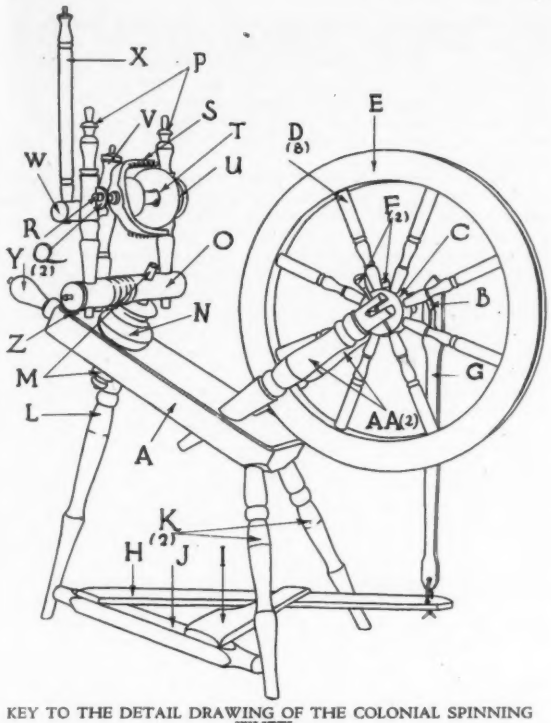
A COLONIAL SPINNING WHEEL

W. Ben Hunt, Hales Corners, Wis.

(See Supplement No. 49.)

The detail drawing of a colonial spinning wheel is based upon measurements of an old wheel in the writer's possession. The base board A, the treadle H, I, J, and the pitman G are

THE ORIGINAL WHEEL FROM WHICH THE DRAWING WAS MADE.



KEY TO THE DETAIL DRAWING OF THE COLONIAL SPINNING WHEEL.

made of ash. Parts B and R are of wrought iron and may be reproduced if desired in soft steel. Part Q, of which two are required, is of leather. The 18 hooks in Part S are made of iron. A leather thong is used to fasten the pitman to the treadle. All other parts are of maple. The screw Y can be made of a wooden-clamp screw and part M, which is used as a nut, can be made from the jaw of a clamp.

Two each will be required of Parts AA, K, and P.

The rim of the wheel is turned and consists of four pieces glued together, the grain running the long way of each quarter segment. To assemble the wheel, fit the spokes in the hub and set them inside the rim, fastening them with ¼" dowels, as shown in the section view of the wheel.

The drawing is as accurate a reproduction of the original wheel as possible, and this fact accounts for the tapered holes in many places. It is suggested that these be bored and then tapered, or better left straight, and that the spindles be turned to fit straight holes.

A SHOP-RECORD SYSTEM

Arthur P. Twogood, Newton, Iowa

An efficient shop-record system, worthy of the name, must meet the following requirements:

(1) It must handle all kinds of supplies.
(2) It must require very little time to keep.
(3) It must be so simple that a student may handle it.
(4) It must permit of a trial balance in short order.
(5) Last, but most important, it must be RELIABLE.

Inasmuch as the system which I have been using for the last five years seems to meet these requirements, I shall briefly describe it. The issuing of supplies in bulk to the various teachers offers no great problem, so I shall omit that part of my plan. I handle all recording work myself, but the plan is equally efficient when the instructor has a foreman to handle this routine work.

There are just two forms and two filing boxes for 3"x5" cards. Form A may be mimeographed on a heavy weight paper, while Form B may be ruled by the teacher. A dozen copies of Form B are usually enough for a year's work. One of the files is fitted with a set of alphabet index cards and is called a "dead" file. The other, or "live" file, is fitted with small 3"x5" folders similar to the large letter folders, one for each pupil. Copies of Form B are posted in the lumber room, finishing room, supply room, and all other places where materials are kept and issued. A supply of Form A is kept in a rack to which the pupils have access. The system in operation works like this:

John Jones is making an upholstered footstool. He has made a shop drawing of the stool and filled out a stock bill, both of which have been checked. He then decides what material he needs first and makes out Form A for just what material he is going to get at that time. I go to the lumber rack with him and copy the data from Form A to Form B while he is getting his lumber. Form A is then put into a box conveniently located for the purpose. When he needs more lumber the process is repeated. A separate blank is filled out whenever he gets any material and the data posted onto the copy of Form B which is nearest the place where the material is issued. The same forms take care of lumber, hardware, and finishing materials.

NEWTON HIGH SCHOOL
SUPPLY REQUISITION

NAME Jones - John DATE 11-3-24
PROJECT Foot Stool

MATERIAL	AMOUNT	PRICE	TOTAL	REMARKS
Walnut	1/4	25¢	38¢	Legs

Twogood INSTRUCTOR

FORM A at left
FORM B below.

SUPPLY RECORD

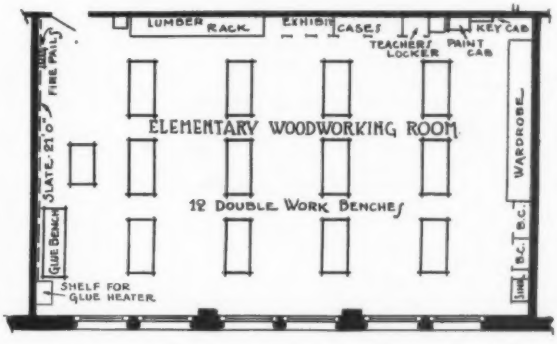
Teacher Twogood Semester 1st Year 1924-1925

Date	Name	Project	Material	Am't	Price	Total	Remarks
11-7-24	Jones - J	Foot Stool	Walnut	1/4	.25	.38	Legs
11-11-24	"	"	"	4	.25	.25	Rails
11-13-24	"	"	Screws	1 doz	.05	.05	For Corner Braces
"	"	"	Sandpaper	1	.02	.02	
11-17-24	"	"	Stain			.02	
"	"	"	Shellac			.05	2 Coats #2-#3
11-17-24	"	"	Wax			.05	2 Coats
"	"	"	Webbing, Burlap, Cotton			.20	
11-21-24	"	"	Leather	12"x14"		.50	

At the end of the day I take the A forms from the box and file them in the "live" file in the proper folder. This takes about five to ten minutes and the system is complete. I have two records of every transaction, and one may be checked against the other in case of error. Knowing what goes into the stockroom at all times, it is only necessary to check Form B for the particular room in order to arrive at an accurate inventory of that room. In case two or more teachers use a stockroom in common, each teacher has a separate copy of Form B.

When John Jones has finished his stool and is ready to pay for it, I turn to the live file, remove his folder, total up his slips for the footstool, and make out a final A card showing only the project and total cost. This card is receipted and placed back in the live file, while the other slips on his footstool are clipped together and properly filed in the "dead" file. This prevents the live file getting cluttered with old records. I write the boy a receipt for his own satisfaction and my protection.

While this system may seem complicated at first, it works so quickly and automatically after a little practice that it is well worth a little study. With such a plan there is no excuse for a teacher getting behind in his records and having to spend hours catching up, as is often the case. Some may feel that the pupil's stock bill may be substituted for Form A. Personally, my experience has been that, after the pupil uses the stock bill during construction, it is hardly suitable to file away.



STANDARD LAYOUT FOR WOODWORK SHOP, NEW YORK CITY.

VOCATIONAL EDUCATION SOCIETY OF BOSTON

Annual Get-Together Dinner

"Organized training for industry must be the chief reliance of the industrial northwest in the grave situation which confronts it," said Lewis A. Wilson, director of vocational education for the State of New York, speaking at the new Elks Hotel, Boston, on Saturday evening, January 8.

To the 150 members of the Society, assembled at their 32nd annual get-together dinner, Mr. Wilson outlined the kinship of New York and Massachusetts in their problems. Both are predominantly industrial states and both have many large cities. Both commonwealths are outstanding for their progressive labor and educational legislation. Of such legislation we are justly proud; yet we must not ignore the fact that it imposes tremendous handicaps upon our manufacturers in competition with those of many other states.

"The Associated Industries of New York," said Mr. Wilson, "are spending one hundred thousand dollars in an investigation to determine the reasons for substantially higher manufacturing costs in that state, and to discover if possible, how this differential may be minimized or eliminated. It is neither probable, nor desirable, that this will be achieved by backward-looking legislation. The answer must be sought elsewhere."

In a certain southern state cited by the speaker, a bill which is being contested in the legislature provides compulsory schooling nine months each year for children up to the age of 14. At present the compulsory school term in that state is only six months. Workmen's compensation laws are nonexistent there; and hours of labor are totally unregulated by law. To that state, fourteen New York manufacturing concerns have recently moved. In Massachusetts the situation is equally serious.

What had vocational education to do with this problem? Mr. Wilson outlined briefly the methods by which accumulated mechanical knowledge and skill have been passed on. He spoke of the earliest as the "followership" method of mere imitation. Though no conscious effort was applied to the imparting of trade knowledge the method sufficed in primitive times, and lasted until the advent of organized, regulated apprentice training.

When the development of industry rendered the apprenticeship system inadequate, vocational education in the modern sense of the word arose. This education was at first aimed at training leaders; it was technical rather than manipulative. Its fruits were the engineering art, and technical schools with which we are now so well supplied. These constituted the first real extensions of the public educational program. In earlier American times, actual illiteracy was the chief and almost the only problem. The colleges touched so few individuals that they were negligible in the general scheme of education. The industries, also, were so simple that the need for specialized training was not keenly felt.

The engineering schools, however, found a rich field waiting for them. Yet, they went through exactly the same experience the trade schools have more recently encountered. Their enrolled students were sneered at, called "mechanics," taunted with pursuing "snap" courses devised for inferior intellects. Today the reverse is true. The "snap students" in any university are more likely to be those taking the liberal-arts courses.

Similarly, fifteen years ago, students in our vocational schools were looked upon as culled pupils who were unfit to pursue high-school work. Partly owing to this attitude, no doubt, the industrial pupils were, on the average, inferior to those in high school. This, however, is emphatically no longer the case.

There are three social changes which are outstanding in the life of the American people, asserted Mr. Wilson. The first is the unparalleled prosperity of the average American home. Our workers are enjoying more of the fruits of prosperity than any other workers in the history of the world. The second notable change is the decreasing size of the American family; a phenomenon to be noted among Americans of foreign stock, as well as among those of our older racial strains. This decrease in the number of children carries as a corollary, an increase in the opportunity and the advantages which each child has. Thirdly, tremendous strides in preventive medicine have increased the average span of life ten years in the last quarter of a century, thus lengthening the individual's period of service by that amount.

These changes point directly to better educational programs, and should convince the doubtful that we can afford whatever expenditure of money such programs involve. Industry is too prone to careless criticism of our mounting educational costs. At the same time, industry has been backward about taking advantage of our educational product; of the training given in our general high schools as well as our vocational schools.

In the early days of trade education in New York, an automobile manufacturer was approached as an employment outlet for trade-school graduates. He protested that he could not possibly use these young men. In the manufacture of his product there were 66,000 operations, he explained. He had no need of machinists nor sheet-metal workers nor electricians. His business demanded only specialists; and he could most effectively train his own specialists. Five years later the same employer asked for every graduate which a near-by trade school could furnish him. He had discovered that the monotony of his standardized operations drove men away from his employment, making his labor turnover and his training expense unwarrantably large. He has since demonstrated the truth of the proposition that an adaptable, all-round man, who can be shifted from job to job, is by far a more valuable employee.

Another concern employing fifteen thousand men is so convinced of this truth that its policy does not permit any employee to remain indefinitely on one job. Every man is shifted from time to time, with a promotion whenever warranted, so that his normal progress is an upward spiral. Every employee is required to fit into some part of the training program maintained by the company. For the carrying out of this training program, the vocational teacher-training division of the New York state department of education trained 37 men as instructors.

The experience of fifteen years has taught vocational educators many valuable lessons, said Mr. Wilson. Foremost among these is the lesson that the vocational-school's job is not more than half finished when it hands its graduate a diploma. We know that there are many fair employers, who always stand ready to give value for value. There are also some unfair ones who do not hesitate to exploit the training and the labor of their workers. Between these two classes, stands a large group of business men who must be "sold" to the idea of vocational education before they can be expected to give fair opportunity to its graduates. Knowing all this, we are shirking responsibility if we merely turn our graduates loose and expect them to find their way alone in the mazes of modern industry. No training is of vocational value unless it results in the placement of its recipient in industry on a definitely advantageous basis. Early records of the trade schools showed failure in this important respect; the actual placing of boys on worth-while jobs. We now recognize that the school's duty extends beyond the school doors, and we are getting better results.

The junior high school development of the past few years has definite relation to our trade education programs. With its emphasis on prevocational work and on vocational guidance, this type of school is, and must be, a feeder to the vocational school. The two are parts of an interdependent system. Vocational guidance, specific advice as to an individual's proper calling, is of little use unless it can tell him how and where to get the training for that calling. The junior high school writes the prescription; the vocational school fills it.

We today realize more fully than ever that industrial education is essentially a centralized, big-city proposition. It can not be developed in terms of school districts. The United States government maintains one West Point for the training of military officers; the state of New York has eleven normal schools for preparing its teachers. It would be no more ridiculous to plant schools for training army officers and teachers in every small town, than to organize and support vocational schools on that basis. Industry itself is largely centralized. The large industrial centers are the logical places for the effective establishment of adequate trade schools. The state of New York finds a dozen or so to be sufficient. It would be more economical to pay transportation charges of students to the large cities, than to try to maintain vocational schools in places of only ten or fifteen thousand population. We must think in terms of trade demand.

Mr. Wilson referred to Connecticut's system of purely state-maintained trade schools. He spoke also of the county system of vocational school organization in the industrial, urban state of New Jersey. A single one of these schools has a present enrollment of 1,800 day students and 6,000 evening pupils; a number larger than the total of industrial students found in 31 states of the United States. Massachusetts, New York, and New Jersey, said the speaker, have squarely stood for the full-time day-vocational school; and their faith is being justified.

Mr. Wilson described the "unit technical courses" in high schools, which are a comparatively new development in New York. These courses aim toward the training of "technical assistants"; those men in industry who stand between the engineer and the mechanic, and for whom there is a very definite need. He took the school at Utica as an example of the popularity and success which these courses are meeting. Every graduate of this school has been placed in industry, and the average wage of last year's class was $28 a week.

The recurrent assaults on the continuation school law came in for comment. Some powerful interests would abolish all compulsory education beyond the age of 14; at the other extreme are those who would enforce full-time education up to the 16th year. "I believe," said Mr. Wilson, "in the dignity of work. But it should be so organized and systematized that our youngsters will get out of it something besides wages." He followed this statement with the startling declaration that, in many instances, industry is paying boys too much. Smaller wages, and more opportunity for thorough training, would be more advantageous both to industry and to the boy. The speaker cited figures from the Bronx Continuation School showing that 55 boys there enrolled are receiving wages of $50 a week or more. It requires little imagination to see a real danger in such a condition. No American home needs so large a return from the labor of its children. A certain union in New York has fixed

the minimum wage of a first-year apprentice at 40 per cent of the journeyman's wage. As an example of sounder judgment, Mr. Wilson referred to the New York photoengravers' union, which with 1,800 members in journeyman status, has 600 apprentices. The apprentice wage is low; and a required attendance at evening courses two nights a week is enforced; yet there is a waiting list of boys who wish to become apprenticed. The printing pressmen of New York have for their apprentices compulsory trade training in school on the employer's time, with pay. The training is far more thorough than a lad would be able to get in any one shop where he might be employed.

The prosperity of our country, concluded Mr. Wilson, has grown in the past from causes which are ceasing to operate. Our raw natural resources are being exhausted. Our ingenious special methods of standardized production are being copied by the rest of the world. Henceforth we must depend chiefly on better trained workers. Industry is coming into full realization of this fact. Employers and employees are cooperating with public authorities in programs which are full of promise for the future.

Besides Mr. Wilson's address, the program included other features, both scheduled and impromptu. Mr. Frank Lane entertained with card tricks, monologs, and musical novelty numbers.

President Robert E. Baker called upon Mr. John C. Brodhead, assistant superintendent of Boston schools, for a brief talk. Mr. Brodhead was one of the seven charter members of the Society, and its first president. He outlined incidents of the early history of manual training and vocational education in Boston, and gave reminiscences of the Society in its infant days. Three other charter members were present: Messrs. Emerson, Hatch, and Clark.

Mr. M. Norcross Stratton, of the Massachusetts department of education, reported some of the high lights of the Louisville convention of the American Vocational Association.

A number of valuable souvenirs donated by business concerns interested in manual and vocational education was distributed, each member receiving a package. Some larger gifts were dispensed as prizes. One went to a bachelor member recently engaged; one to the "champion hustler" for new members, Mr. Weldon of Medford; and one to Mr. Rose, director of manual training and drawing at Providence, R. I., because of his unflagging interest in the Society and its meetings in spite of distance from its headquarters. Five other prizes were awarded—*Frederick Ames Coates.*

JANUARY MEETING HELD

School Crafts Club, New York City

The School Crafts Club held a dinner meeting at Geneva Restaurant in New York City on Saturday evening, January 15, 1927. Despite a blustery wind and snow storm, a good-sized group of men turned out to hear the four speakers on the program. Even the speakers were there one hundred per cent. The hot soup and beef steak tasted mighty good after the bitter cold walk from the subways!

Two men were accepted as new members of the club: Milton I. Jacobi of Brooklyn, W. H. Milliken of Binney & Smith Co., New York City.

Mr. W. C. Wright, from Henry Disston & Sons, told the club members about "Crucible Steel and Its Uses in Industry." The men learned that the crucible method of making iron is very old. It was known in China ages ago, back in 3600 B. C. Steel blades have been found in the pyramids. The Greeks used four kinds of steel in Damascus.

The crucible steel method used today is almost two hundred years old. Of course improvements are being made constantly in materials, appliances, and methods. The crucibles are lined with fire clay and graphite. The charges are one hundred pounds of Swedish iron, which is low in phosphorous and sulphur content. Only a quiet bubbling takes place as the iron is converted into steel. The man who attends a crucible approaches it with soaking wet clothing, which becomes bone dry in fifteen minutes. He pours the steel into molds which form ingots. These in turn are rolled into slabs which are surface ground to remove imperfections. The perfect slabs are further rolled down until steel of saw thickness results. Steel must pass tests for strength, elasticity, and fine grain.

The Disstons were first in electric as well as crucible steel. The electric steel may be produced in much greater quantities and is used for such articles as dies. The electric steel is more likely to contain defects than crucible steel.

Mr. Wright also used a moving picture of two reels showing the lumbering process used in obtaining the material for saw handles. The pictures were taken near Spokane, Washington.

"What a High-School Shop Teacher Might Expect of the Entrant" was discussed by Mr. Fred C. Arnold, teacher of mechanic arts, Evander Childs High School, New York City. Mr. Arnold does not want to be misunderstood as trying to dictate what elementary shop teachers should teach to their pupils, since conditions vary as to teacher preparation, teacher interests, and equipment. However, he emphasized some items which an elementary school graduate might know as follows:

C. L. WETZEL,
Jefferson City, Mo.

Since December 1, Mr. Wetzel has served as State Supervisor of Trade and Industrial Education for the state of Missouri. Mr. Wetzel has had trade experience and for ten years was instructor in the Lathrop Trade School of Kansas City, Missouri. During 1925, he conducted a class in teacher training at the University of Texas and for some years previously he assisted in teacher training work in addition to his regular duties as instructor at the Lathrop School.

1. To recognize common woods and metals.
2. Something about how and when to apply fastenings.
3. To use a rule, square, saw, plane, and other common tools.
4. To be able to make a simple sketch.
5. How to sharpen edge tools (not saws).
6. How to bore a hole.
7. How to cut a mortise.
8. How and when to use a file.
9. Something about finishes.
10. To be observing.
11. Properties of wood.
12. To have discrimination as to standards of workmanship.
13. Some development of manipulative skill.
14. Method of approach in attacking a job.

Mr. Clarence L. Webb, teacher of shopwork, New York City, spoke on "The Steel Square and Its Use in Roof Framing." Mr. Webb, who teaches the subject in the Curtis Evening High School, demonstrated with a square the layout of the various cuts, such as overhang, plate, and ridge on common, hip, valley, and jack rafters.

Mr. A. H. Frewert, teacher of shopwork, New York City, spoke on "Fitment of Circular and Band Saws." Among processes covered by Mr. Frewert were the jointing, setting, and filing of saw blades. He also explained how jigs could be placed upon the circular saw table to accomplish special jobs such as simple shaping work on square edges.—*Lloyd F. Stair.*

MILWAUKEE PREPARES FOR CONVENTION

Local committees have been appointed for the entertainment of the Western Arts Association during its convention, May 4, 5, 6, and 7, at Milwaukee, Wisconsin. Supt. M. C. Potter of the Milwaukee city schools, has become general chairman for the convention and Mr. Charles F. Perry, associate superintendent in charge of vocational education, is general secretary and is actively directing the preparations for the convention. The following additional committees have been appointed:

General Committee: Mr. M. C. Potter, Mr. W. C. Wehe, president of the board of school directors; R. L. Cooley, Director of the Milwaukee Vocational School; Dr. Frank E. Baker, President of the Milwaukee Normal School, and Miss Lucia Briggs, President of Milwaukee-Downer College.

Chairmen on subcommittees are as follows: Registration and Information, Mr. R. A. Matasek, Department of Commercial Art, Milwaukee Vocational School; Hospitality, Miss Charlotte Partridge, Director of Layton School of Art; Transportation, Mr. Gustave Moeller, Director of Art Department, Milwaukee Normal School; Dinner, Miss Ella L. Babcock, Director of Household Arts, Milwaukee Public Schools; Luncheons and Reunions, Miss Marjorie S. Logan, Director of Art Department, Milwaukee-Downer College; Music, Mr. Herman F. Smith, Director of Music, Milwaukee Public Schools; Commercial Exhibits, Mr. Charles F. Perry, Assistant Superintendent in charge of Industrial Education, Milwaukee Public Schools; School exhibits, James L. Cox, Principal Boys' Technical High School, Milwaukee; Publicity, A. G. Pelikan, Director of Art, Milwaukee Public Schools and Director Milwaukee Art Institute; Hotels, Ora A. Blanchar, Principal Girls' Trade and Technical High School, Milwaukee; Finance, Frank Bruce, The Bruce Publishing Company; Local Membership, Mr. B. B. Burling, Head of Electrical Department, Boys' Technical High School, Milwaukee.

NOW, ARE THERE ANY QUESTIONS?

Model Garages

632. Q.: I am planning to have some of my woodworking classes build some model garages and to construct the frames of houses to scale from plans this year. I want you to suggest the book or books on carpentry that contain the information necessary to build various types of house frames and roofs.—J. N. W.

A.: These books will be helpful:

Carpentry. Griffiths. $1.70. Manual Arts Press, Peoria, Ill.
Modern Carpentry. Hodgson. $1. F. J. Dranke Co., Chicago, Ill.
Practical Carpentry. Radford. $2. Radford Architectural Co., Chicago.
Practical Carpentry. $2. Shrewesbury Publ. Co., Chicago, Ill.
Carpentry. Townsend. $1.50. American Technical Society, Chicago, Ill.
House and Barn Framing. Radford. $1. U. P. C. Book Co., New York.
Roof-Framing Tables. Griffith. $1.25. Manual Arts Press, Peoria, Ill.
Carpentry and Joinery. Lowndes. $2.50. David McKay, Philadelphia, Pa.
Good Practice in Construction. Knobloch. Two books; $4 each. Pencil Points Press, New York, N. Y.
Problems in Carpentry. L. M. Roehl. $1. Webb Publishing Co., St. Paul, Minn. (1913.)
Stair-Builders' Guide. Morris Williams. $1.50. U. P. C. Book Co., New York. (1914.)
A-B-C of the Steel Square. F. T. Hodgson. $1.50. F. J. Drake Co., Chicago. (1905.)
Architects' and Builders' Handbook. F. E. Kidder and Thomas Nolan. $7. John Wiley & Sons, New York.
Drawing for Builders. Dale. $1.50. John Wiley & Sons, New York.
Progressive Steps in Architectural Drawing. Seaman. $1.25. Manual Arts Press, Peoria, Ill.

Current magazines of the Radford Architectural Co., Chicago, and of the Building Age Company, New York City; the reference books of the American School, Chicago, and of the International Correspondence School, Scranton, Pa., are also very useful.

Walnut Finish

702. Q.: I would appreciate a little help in a finishing problem. What stain may I use to get a good finish on walnut or birch? I have used both oil and the so-called penetrating stains, but with the same result of dark and light patches in wavy grained wood. I would like to try a water stain, but have no formulae for any.—G. G. S.

A.: The results which you have obtained in staining wavy grained walnut and birch is entirely to be expected. In fact, the wavy grain is selected to get exactly that result. Why destroy its beauty? —*R. G. Waring.*

Quick Finish on Poplar

708. Q.: I have the problem of finishing poplar in a dusty, crowded shop. Wax leaves a gray effect in all rough grain of the wood. Can you recommend a way of getting a successful wax or other simple and quick finish on this wood?—T. O. M.

A.: 1. The wood should be sanded until smooth so that there will be a good foundation for the finish. After this is done, there should be no trouble in finishing.

2. It is suggested that you apply three coats of shellac and oil, and rub, or

3. Brush on a coat of shellac which has been cut one half with alcohol and sand with split 6-0 paper when dry. Then apply wax.

4. Another quick and very satisfactory finish consists of two or three coats of clear lacquer, allowing three hours between coats. Rub the last coat of lacquer with the following:

Crude oil, 5 oz.	Butter of antimony, ⅓ oz.
Vinegar, 2 oz.	Oil of citronella, ½ oz.
Denatured alcohol, 3 oz.	Water, 5 oz.

Add one cup of rottenstone and shake well. Make up a pad of cotton flannel or heavy soft cloth, apply the polish freely, and use with plenty of "elbow grease" by rubbing heavily in straight lines. This will polish up full and bright, with a dry, soft, and clean cloth, and will leave a surface free from any trace of oil or bloom.

Lacquer will be found very satisfactory because it does not gather dust.—*Ralph G. Waring.*

Balsa Wood

713. Q.: I would like data in regard to Balsa wood. Being so very light, is it tough and strong? Would it not be excellent material for ladders? Where may it be obtained, etc.?—E. M. S.

A.: Balsa wood is one of the lightest of all woods, weighing in some cases as low as six pounds per cubic foot when free from moisture. However, it is extremely variable in weight, and is reported to range in specific gravity (based on oven-dry weight and volume) from 0.10 to 0.25.

Balsa wood is very absorbent, and when placed under water, light pieces may absorb as high as 500 to 600 per cent moisture. Its life is said to be short under ordinary conditions unless treated with a preservative.

The only tests which we have made on Balsa wood are compression parallel to grain and hardness tests. The data from these tests show, as would be expected because of its light weight, that balsa wood is considerably lower in compression parallel to grain and hardness than such woods as northern white cedar, basswood, and chestnut.

Three tests of a sample weighing 6.8 pounds per cubic foot, having a specific gravity of about .105, had a maximum crushing strength of 1,220 pounds per square inch at a moisture content of 3.8 per cent. Soaked pieces from the same sample had a weight per cubic foot of 42 pounds, and a maximum crushing strength of 640 pounds per square inch. We do not have any values on any of the other mechanical properties of this species. On account of the great variability in the weight of balsa and the limited number of tests, the values given above should not be regarded as representative of the species, but only as an indication of what may be expected of material of equivalent specific gravity.

We have no definite information as to sources from which balsa may be secured. We know that it grows in Central and South America and some of the islands adjacent. For further information along this line we refer you to the American Balsa Company, 50 East Forty-second Street, New York City.—*United States Forest Products Laboratory.*

SHOP TEACHER'S CALENDAR

Tasks for March Shop Management.—Start list of tools and equipment needed for next year. Hold teachers' meetings to discuss problems and projects for the early spring. Inspect the classes to see that the work is up to the standard. Check the progress of pupils and make reports of failures. List material made up and sold, and equipment made for the shop.

Instruction.—Give talks on vocational subjects. Encourage early trade selections. Emphasize the use of the school library. Organize birdhouse clubs and arrange model airplane contests.

Problems.—Arrange for spring projects such as mail boxes, hotbed frames, garden and window boxes, playground apparatus, sand tables, weather vanes, garden furniture, tennis-court markers, porch workboxes, racks for garden tools and implements, rain gauges, and window box refrigerators.

Community Service.—Cooperate with local agencies in making plans for annual clean-up day, etc.

Commencement.—If possible prepare for a "shop" commencement demonstration.

Manual Arts for Vacation Schools

714. Q.: I am very much interested in certain types of manual-arts work for daily vacation schools and certain kinds of home work and should like to have you give me sources for the following materials: Brushmaking, rugmaking, cane and basket weaving.—*J. C. M.*

A.: The following books are suggested for use in connection with these subjects: *Kiddier's Brushmaker and the Secrets of His Craft,* $1, Isaac Pitman, New York; *Hooper's Hand Loom Weaving,* $2.25, Macmillan Co., New York; *Hall's Hand Woven Coverlets,* $4, Little, Brown & Co., Boston; *Worst's Foot-Power Loom Weaving,* $5, Bruce, Milwaukee; *Laise's Hooked Rugs and How to Make Them,* $2, Macmillan Co., New York; *Wheeler's How to Make Rugs,* $1, Manual Arts Press, Peoria; *Hall & Buck's Handicraft for the Handicapped,* $1.50, Moffat, Yard & Co., New York; *Hick's Handicraft in the Home,* $2, McBride & Co., New York; *Kendrick & Tatersall's Hand-Woven Carpets,* $32, Chas. Scribner's Sons, New York; *Blanchard's Basketry Book,* $2, Chas. Scribner's Sons; *White's How to Make Baskets,* $1, Milton Bradley Co., Springfield, Mass.; *Marten's Inexpensive Basketry,* $0.30, Manual Arts Press, Peoria; *Turner's Basket Maker,* $0.75, Atkinson, Mentzer & Co., New York, Chicago; *Gill's Practical Basketry,* $1, David McKay, Philadelphia; *Perry's Seat Weaving,* $1.25, Manual Arts Press, Peoria; *Worst's Problems in Woodwork,* $2.50, Bruce; *Hyatt's Furniture Weaving Projects,* $1.75, Bruce.

The following firms can furnish supplies and materials for the different kinds of work listed: *Brushmaking*—E. B. & A. C. Whiting Co., Burlington, Vt.; Magnus Brush Materials Co., 604 W. Lake St., Chicago; Horvich, Vitkin Co., 2301 S. Paulina St., Chicago; C. H. Feldstein Co., 1839 E. Madison St., Philadelphia, Pa.; Braman Mfg. Co., Carthage, N. Y.; C. D. Dickinson & Son, North Hadley, Mass.; Pickering Mfg. Co., 1605 N. Park Ave., Philadelphia, Pa. *Looms*—Dana Todd, 40 S. 8th St., Minneapolis, Minn.; Faribault Looms Industries, Faribault, Minn.; Reed Mfg. Co., Springfield, O.; J. L. Hammett Co., Cambridge, Mass.; Thomas Charles Co., 2249 Calumet Ave., Chicago; Nuttelman Mfg. Co., Florence, Mass. *Cane and Reed*—Thomas Charles Co., 2249 Calumet Ave., Chicago; E. W. A. Rowles Co., 327 S. Market St., Chicago; L. S. Drake Co., 33 Everett St., Allston, Mass.; A. F. Burch Co., Grand Rapids, Mich.; E. B. Frain Co., 6229 University Ave., Chicago. *Basketry*—L. S. Drake Co., Allston, Mass.; J. L. Hammett Co., Cambridge, Mass.; Milton Bradley Co., Springfield, Mass.; Jayson Co., 217 Mercer St., New York City.

A marking gauge of merit

THE Stanley Marking Gauge No. 265 is especially adapted to school use. It is made of the same high quality of boxwood that is used in the manufacture of Stanley Rules. It has a brass screw, brass shoe and face plate, and an adjustable point. A round-head screw at the end of the beam keeps the head from sliding off. This adds materially to the life and accuracy of the gauge, and eliminates the loss of the brass shoe.

A distinct feature of the No. 265 gauge is that it is not graduated. This is an aid to good craftsmanship, as it makes necessary the setting of the gauge with a rule. Thus inaccuracies due to improper setting and filing of the pin are avoided.

Stanley Gauge No. 265 is furnished with a square head only. No. 264½ is made of beechwood and has an oval head.

THE STANLEY RULE AND LEVEL PLANT
Educational Department
NEW BRITAIN, CONNECTICUT

THE Stanley Catalog No. 34-G should be in the hands of every Manual Arts Instructor or Vocational Supervisor. It lists and shows pictures of over 1500 items, as well as detailed drawings of their construction and adjustment.

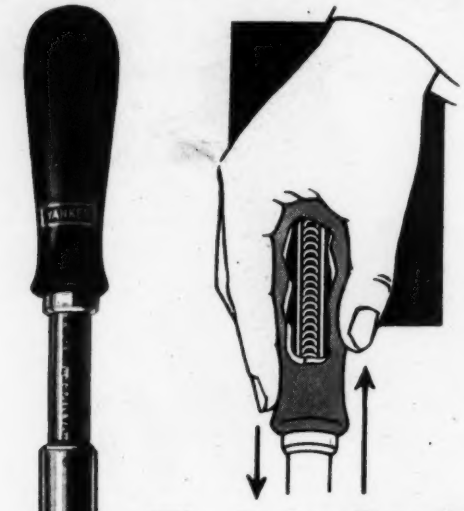
In addition, the appendix gives a number of tables covering subjects pertinent to woodworking.

You should have a copy of Catalog No. 34-G by all means. Send for yours today.

STANLEY TOOLS

STANLEY EQUIPMENT IS STANDARD EQUIPMENT

Good Schools deserve "YANKEE" TOOLS



The Spring Puts Magic into "YANKEE" No. 130-A

JUST PUSH! The spring in handle and "Yankee" Spiral do the work for you —and save your time.

Without loss of a second, the spring brings handle back ready for the next push.

And the tension keeps blade in screw slot, leaving one hand free to hold work.

One handed, you can quickly drive (or draw) screws in the most difficult places with this "Yankee" Quick-Return Spiral Ratchet Screw-driver No. 130-A.

Right-hand Ratchet, Left-hand Ratchet and Rigid. Three sizes of bits.

No. 130-A. Standard size.
No. 131-A. Heavy pattern.
No. 135. Light pattern.

"Yankee" Spiral Ratchet Screw-drivers, without the Quick-Return feature, No. 30-A, No. 31-A, No. 35.

Some other "Yankee" Tools

Plain Screw-drivers
Ratchet Bit Braces
Ratchet Breast and Hand Drills
Automatic Push Drills
Automatic Feed Bench Drills
Vises, Removable Base

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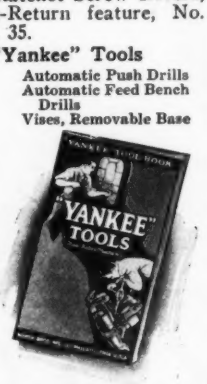
This interesting little book is for all lovers of fine tools. It tells just what you want to know about all the famous "Yankee" Tools. Write for your copy today.



"Yankee" on the tool you buy, means the utmost in quality, efficiency and durability.

NORTH BROS. MFG. CO., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

NEWS AND NOTES

Carpentry Class. A class in plan reading and estimating for carpenters has been conducted at Arkansas City, under the direction of Mr. C. F. Kneidler.

Automechanics Shop. An automechanics shop has been opened in the high school annex at Hutchinson, Kans. An evening class in automechanics has been formed under the direction of Mr. V. H. Stroud.

Courses Extended at Falmouth. The practical-arts courses in the high school at Falmouth, Mass., have been extended to increase the holding power of the school. The household-arts department has been enlarged to include courses in hygiene, design, house planning, and furnishing. The agricultural department has reported an increase of more than 100 per cent in the enrollment for the year.

Vocational Education in Pennsylvania. The Department of Vocational Education of Pennsylvania gives service to local communities in analyzing occupational needs and opportunities, and in organizing the needed vocational courses and planning for the shop and laboratory equipment.

Practical-arts education concerns itself with those activities which aim to give first-hand information and practical experience relating to the home, the shop, the office, the store, and the farm. More than 300,000 boys and girls in the state now have the benefit of practical-arts instruction in the agricultural, home economics, and industrial fields. Specific vocational instruction is being given to 50,000 young people and adults throughout the schools of the state. The department assists local school districts in developing and organizing continuation-school activities. In recent years the chief service rendered has been the up-grading of the organization and administration of these part-time schools.

Agricultural education, it is shown, has made steady growth during the biennium just passed, as indicated by increased enrollment and an increase in the number of teachers thus necessitated. In twelve agricultural schools an assistant was required. The home-project work has shown larger returns than in any previous period. During the past two years 3,850 boys and girls conducted junior projects in agriculture, and a total of 504 practical farmers received instruction in vocational agriculture in addition to the boys enrolled in the vocational schools.

A total of 110 school districts are maintaining continuation schools at the present time, 92 of which are in eastern Pennsylvania. Approximately 40,000 boys and girls receive the benefits of this instruction. Sixty per cent of these pupils attend continuation schools in the two first-class districts; 21 per cent in twelve second-class districts; nineteen per cent attend in 96 third and fourth-class districts in the state. In other words, 81 per cent of the continuation school pupils in the state are enrolled in fourteen of the larger cities.

The continuation schools which are of three types are provided with proper buildings and equipment. The organization in the small junior high school has resulted in more efficient organization and instruction. In Philadelphia and Pittsburgh, placement service, guidance, and follow-up work have been well organized.

Home economics education is a part of the vocational program in 303 junior and senior high schools, in 34 continuation schools, in 24 evening schools, and in thirteen teacher-training institutions.

During the period covered by the report, seven new departments of vocational home economics have been established in day schools and seven new departments in evening schools have been organized, making a total of 111 high schools, vocational schools, and evening schools now conducting home economics on a vocational education basis.

Industrial education, it is shown, has met the need for better preparation of trade and industrial workers through day-unit trade classes, evening trade-extension or up-grading classes, part-time trade-apprenticeship classes, and trade schools for girls over 16 years of age.

Issue 1927 Safety Calendar. The Carnegie Steel Company, of Pittsburgh, Pa., has issued its 1927 safety calendar, which is intended to broadcast the gospel of safety and to instill in the youth of the country the lesson of carefulness. The calendar is the fourth to be issued by the company and its illustrations are the work of pupils in the schools of the ten cities where the company has its manufacturing plants.

Vocational Evening Classes. Vocational classes in carpentry and cabinetmaking have been conducted in the evening vocational school at Schenectady, N. Y.

Pupils Enrolled in Vocational School. The Brewster Vocational School at Tampa, Fla., enrolled 2,500 students in vocational classes during the past term. The sheetmetal department and the workshop have undertaken the construction of articles for the school.

Apprenticeship—Not Day Labor. *Domestic Engineering* recently published an editorial in which it was shown that the question of apprenticeship in the plumbing and heating industry has become somewhat mixed up with the so-called "younger-generation problem." The editorial pointed out that industry needs more journeymen, and that journeymen are made from apprentices. It is not true that

(Continued on Page 30a.)

Sargent tools simplify the instructor's job

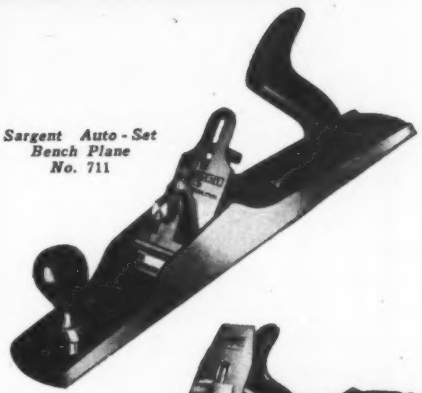
Sargent Clamps Nos. 13, 16 and 22

HALF the problem of manual training is solved by good tools. Here are good tools—designed and developed especially for students from master tools that have been the choice of careful carpenters and wood-workers for years. These are built, fitted and finished with exactly the same skill and care.

Sargent Planes have no superiors for speed, precision or rigidity. Indeed, the Auto-Set or "700" line is in a class alone. Here, the cutter of keen edge-holding chromium steel may be removed, sharpened and replaced without changing the original adjustment. You can see what this feature will mean to your students. The Auto-Set is also very light in weight, roomy around the grips and so strongly built that it will withstand years of punishment. No. 711 was designed especially for manual training use. The "400" line offers the best planes of this type made.

Sargent steel squares are made in every practical style. Both 30-N and 30-B, which are especially suitable for most school jobs, have a body 18 x 1½ inches and a tongue 12 x 1 inch. Sargent clamps are strong and practical. The finely fitted screw is of steel; the head and swivel are malleable iron. Nos. 13, 16 and 22, which open to 3, 6 and 12 inches, are recommended for manual training work.

Sargent tools are sold by good dealers everywhere. See them there and write us for catalog and particulars.



Sargent Auto-Set Bench Plane No. 711

Sargent Adjustable Iron Bench Plane No. 411

Sargent Standard Steel Squares. No. 30N, nickel plated. No. 30B, blued, white figures

SARGENT & COMPANY, *Manufacturers*
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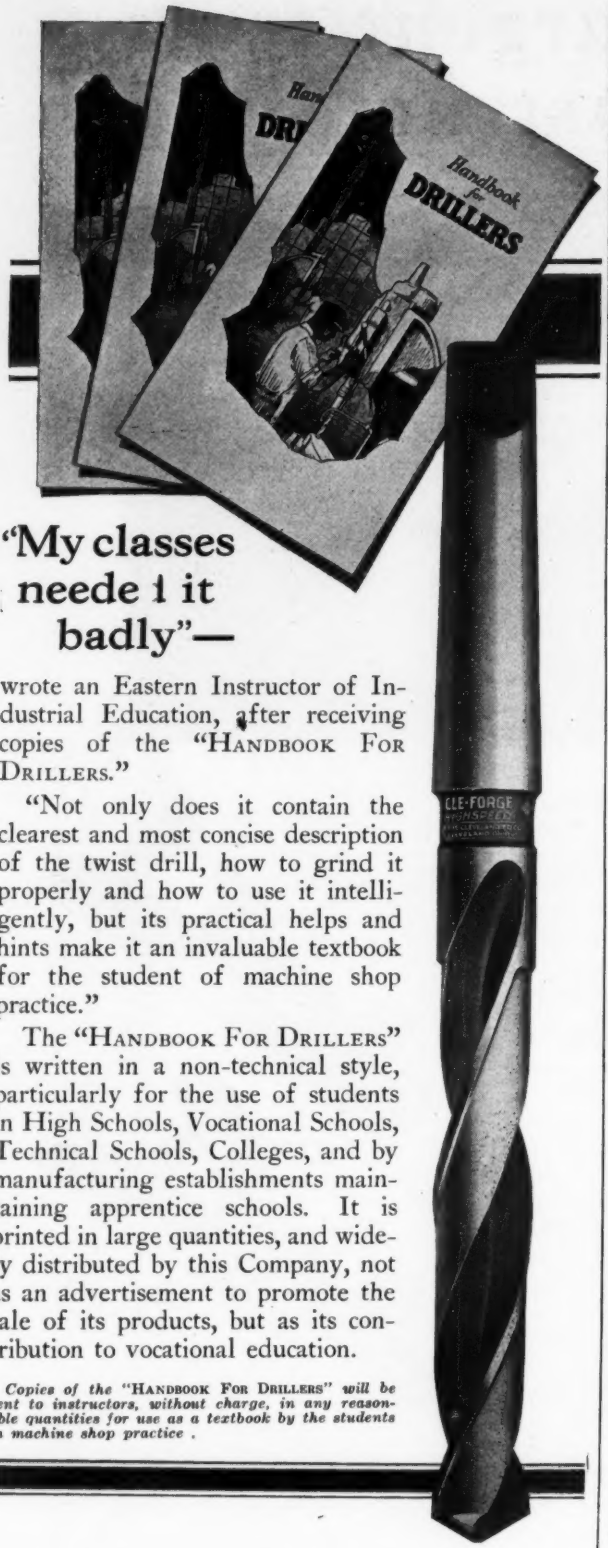
Tools & Hardware



"My classes neede I it badly"—

wrote an Eastern Instructor of Industrial Education, after receiving copies of the "HANDBOOK FOR DRILLERS."

"Not only does it contain the clearest and most concise description of the twist drill, how to grind it properly and how to use it intelligently, but its practical helps and hints make it an invaluable textbook for the student of machine shop practice."

The "HANDBOOK FOR DRILLERS" is written in a non-technical style, particularly for the use of students in High Schools, Vocational Schools, Technical Schools, Colleges, and by manufacturing establishments maintaining apprentice schools. It is printed in large quantities, and widely distributed by this Company, not as an advertisement to promote the sale of its products, but as its contribution to vocational education.

Copies of the "HANDBOOK FOR DRILLERS" will be sent to instructors, without charge, in any reasonable quantities for use as a textbook by the students in machine shop practice .

The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

(Continued from Page 28a.)

the boy does not want to learn a trade. But he is wise enough to know that if, as an apprentice at apprentice wages, he must drive a truck or work as a day laborer, he might better hire out as such. The main responsibility of the trade is to offer the boy the proper training. Every apprentice is in the shop to learn and he has a right to expect such training.

Foreman Training at Wichita. Conferences with two groups of foremen have been completed recently at Wichita, Kans. There were 80 foremen and subforemen who attended the conferences.

Railway-Shop Mathematics. Two successful classes in railway-shop mathematics are being conducted at Herington, Kans. The men are interested in the practical problems studied.

Foremanship Conference. A conference of unusual interest was held in November at Topeka, Kans. The conference was called for the purpose of acquainting Kansas industries with the conference method of training foremen. A number of the large industries were represented and became greatly interested in the service rendered by the state vocational board.

More Work Favored for Dull Children. Mr. Howell Cheney, of Manchester, Conn., in submitting a report of the committee on junior education and employment of the National Association of Manufacturers, points out that increased schooling for a majority of children does not mean increased earning capacity. The report emphasizes that raising the age of compulsory school attendance simply forces a large percentage of children to repeat grades without benefit either to their mental attainments or their future earning power; also that many more children leave school and go to work because of mental inability to keep up with their studies than because of poverty, and that factory employment offers more opportunity for high wages and promotion than the white-collar jobs.

Joliet Printshop Boys Prepare Greetings. The boys of the Joliet Township High School printshop at Joliet, Ill., prepared Christmas greetings and presented them to the members of the faculty. The greetings were prepared as part of the class project directly before the Christmas season and were taken from parts of the book of St. Luke. Thirteen boys composed the class in charge of the work.

Printshop Boys Issue Calendar. The Boys' Vocational School printshop at Albany, N. Y., recently printed a calendar as a regular project. The calendar is printed in color and each month of the calendar is headed with an appropriate saying or quotation.

Open Second Essay Contest. The United Typothetae of America has announced a second essay contest on "Franklin's Contribution to American Independence." The contest closes June 1, 1927. A gold medal will be given by the International Franklin Society to the printing student or apprentice who writes the best essay on the subject.

Open Course in Foundry Work. The board of education, Pittsburgh, Pa., in cooperation with the local foundrymen's association, has completed plans for the establishment of a course in molding and foundry-work in the Allegheny Vocational School. The foundrymen have offered to donate a considerable portion of the expensive parts of the equipment, such as melting furnaces, coke ovens, and the like, also patterns, molding sands, and molding materials. Among those eligible to the classes are the apprentices of the Locomotive Stoker Company, the part-time foundry apprentices, and the boys from the regular drafting department of the school.

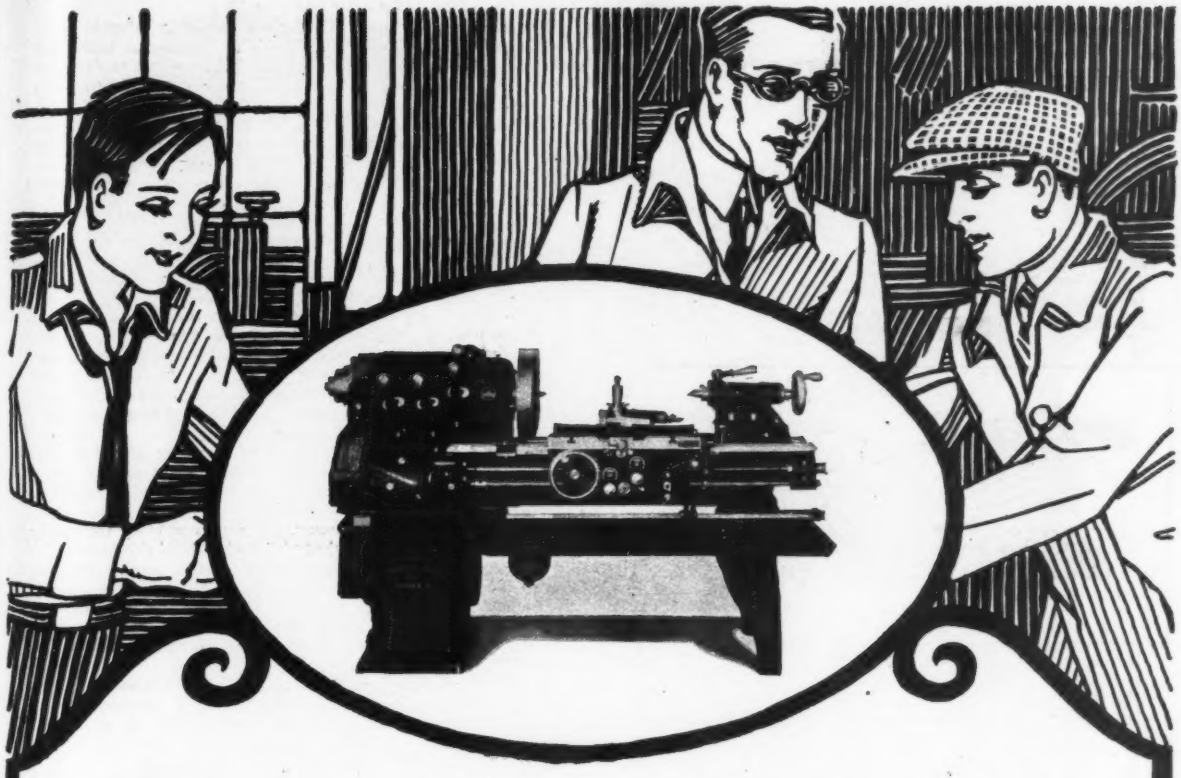
Vocational Training for Pupils Forced to Leave School. The St. Louis, Mo., board of education has made provision for vocational training for pupils who find it impossible to finish the regular course in the intermediate and high schools. To this end it is planned to establish a school of vocational type devoted to the needs of those looking toward early employment. For the present the school will be housed in temporary quarters adequate for this type of instruction. Mr. T. E. Spencer has been appointed as organizer and director of the work.

St. Paul Schools Construct Miniature Homes. The manual training departments of eight junior high schools of St. Paul, during the period from February 1 to June 1, will construct thirty miniature homes. The work will be done under the general supervision of Mr. George M. Brace, director of manual training and vocational work, and will be directly supervised by the manual training instructors in the various schools.

The homes to be constructed will be three feet by five feet in size, in either Dutch colonial or bungalow design, and complete from the standpoint of construction, including flooring, windows, doors, electrical wiring, and paint. All the work will be done by pupils and each boy will participate in at least one of the steps as the work progresses.

The schools will compete for the honor of turning out the best miniature home. The Northern Building and Loan Association of St. Paul has offered a prize of $100 to the school presenting the best designed and constructed home of either type, and a second prize of $50 for the next best production.

(Concluded on Page 32a.)



Train Your Students for their Jobs — Use MONARCH LATHES

Train your students on MONARCH LATHES and when they go from your school they will be ready for their jobs —valuable men immediately without the necessity of going through another period of training in the shop.

The student that is trained on a Monarch Lathe is trained in actual shop practice — for the Monarch is the first choice of Industrial America. Today more Monarch Lathes are being sold to industrial plants than any other lathe built.

The Monarch motor-driven, helical geared Lathe is the ideal equipment for instructional purposes. It is far in advance of other lathes in design. It is as near danger-proof as any lathe can be made. It is as noiseless as any lathe can be—an important advantage in the instruction room.

Monarch Lathes are used in the Massachusetts Institute of Technology, Yale, Cornell, and in hundreds of the best technical and high schools — proof that the Monarch is the practical lathe for modern school equipment.

The success of your school and the success of your students are inseparably linked together. Use MONARCH LATHES and meet the modern demand for training that *fits men for their jobs.*

Illustration above shows 14 x 6 helical geared Monarch Lathe

THE MONARCH MACHINE TOOL CO.

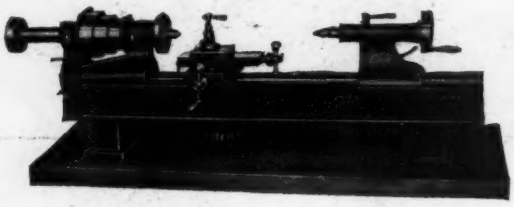
100 OAK STREET - - - - - - SIDNEY, OHIO

ANNOUNCING

The

Rivett

Junior
Bench Lathe
No. 507



The Perfect Lathe For School Shops

Forty years of experiment and experience have produced the perfect machine in the Rivett Junior Bench Lathe No. 507.

The Rivett Junior is entirely new in design and embodies the development of bench lathe art up to the present time.

Manual Training Instructors will find this new lathe of particular advantage. Because of the small space it occupies more machines can be installed and instructors will be able to handle larger classes. The Rivett Junior Bench Lathe No. 507 is correct in every proportion and under hard usage will maintain accuracy.

WRITE FOR BULLETIN No. 507A

The Rivett Bulletin No. 507A is a combination catalogue and lesson plan book giving very interesting and helpful information for the teacher's use. Every Manual Training Instructor should write for one of these bulletins.

Rivett
LATHE AND GRINDER CORPORATION
BRIGHTON DISTRICT OF BOSTON, MASS

(Concluded from Page 30a.)

Prepare for National Airplane Contest in March. Boys from Detroit, Mich., schools, and schools of neighboring towns, will participate in the elimination contest to be held March 18 to determine Detroit's representative in the National Model Airplane Contest to be held March 19.

To encourage the best talent in the city, the Detroit Free Press, in cooperation with the schools, has printed plans and specifications for the construction of model airplanes. In addition, booklets, prepared by one of the school instructors, are available to all pupils interested.

It is announced that cash prizes, totaling $500, will be offered for the competition. The Stout trophy for model airplane flying, will be offered for the first time in national competition. Contestants from Indiana, Illinois, Oklahoma, and Massachusetts are expected in Detroit in March to try for the trophy and prize money.

Will Issue Daily Paper During Convention. Students of the Dallas, Tex., schools, under the direction of Supt. N. R. Crozier, will issue a daily paper during the National Education Association Convention to be held February 26 to March 3, at Dallas. Under the arrangement, the journalism classes will have charge of the gathering of news happenings, and the boys of the printing departments will set the type and print the paper.

As this is an unusual undertaking—the printing of a daily convention paper—much interest will be displayed by the students taking part in it, and no doubt will furnish them with good, practical experience. The demonstration of students publishing a convention paper will be watched with interest. The plan is being fostered by Barnhart Brothers & Spindler, through its educational department.

Vocational Courses. The evening schools of South Bend, Ind., enrolled more than 300 persons for courses (exclusive of foundry practice, which attracted 122 pupils). Courses for home-makers embrace sewing, millinery, cooking, and food study. Mechanical and industrial branches cover such subjects as machine-shop practice, auto mechanics, electricity, and radio.

New Vocational Courses. The Union High School at Marysville, Calif., has adopted a new policy providing vocational courses for boys and girls. The new courses are the result of an intensive survey of the school system conducted last fall by Dr. E. H. Proffit of Stanford University.

For the first year, or ninth grade, it is planned to offer a general shop course, giving practice in the elementary, fundamental, and manipulative abilities in connection with common materials used in production and repair work. The object of the work is to provide boys with opportunities for finding the special courses to which they are best adapted.

The nonvocational course will provide training for use in industrial products and service. An illustration is the teaching of automechanics. Special courses will also be offered for girls. This work will embrace the care and use of electrical appliances and apparatus and other mechanical devices in the home. A farm-mechanics course is also in operation.

Evening Class for Apprentices. The board of trustees of the Paterson Vocational School at Paterson, N. J., has asked for the establishment of an evening class for printers' apprentices.

Vocational Department Established. A department of vocational training has been established at Gainesville, Fla., which will offer part-time training in commercial subjects to employed men and women. The training will include commercial subjects, office filing, etc., and classes are at present in operation. A small fee will be charged for registration and textbooks.

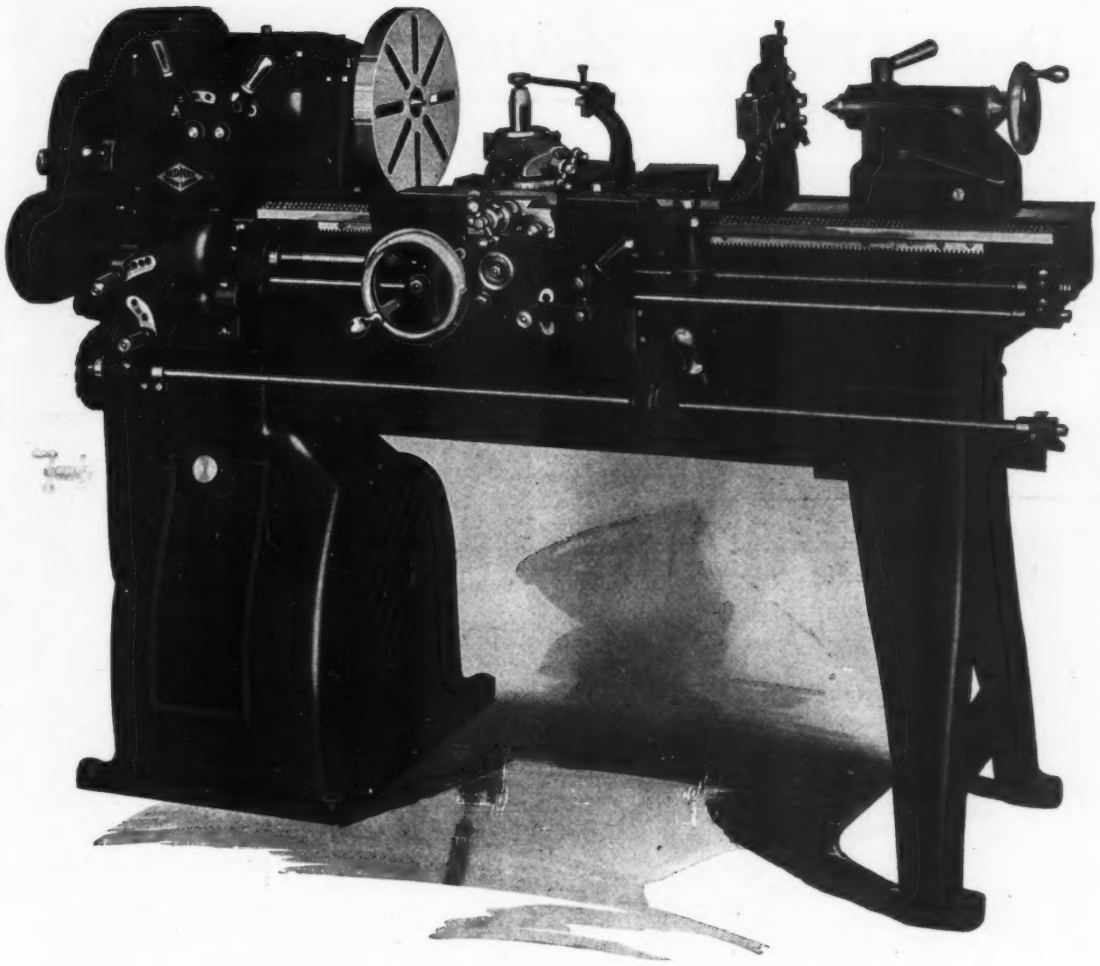
Teach Bookbinding. A course in the elements of bookbinding was opened during the fall semester at Battle Creek, Mich., vocational school. A regular course in bookbinding will be offered during the second semester. The course is intended to offer a knowledge of bookbinding and mending, and to teach the mending of books at home.

Evening Vocational Courses. The school board of St. Petersburg, Fla., has opened an evening school offering courses in electrical engineering, business drawing, practical mathematics, steel square, millinery, sewing and industrial arts for women. Practical work in the vocational-school shop has included boatbuilding, carpentry, machine-shop practice, electrical work, and automechanics.

Talks About Trades. Mr. C. L. Bailey of Pittsburgh, Pa., recently gave a series of talks to junior-high-school boys of Erie on the selection of a trade or vocation. In making the talks, Mr. Bailey emphasized that boys pick a trade that is certain to grow with the population.

Vocational Classes Open. Classes in blue print reading, show card writing, and art metal work were offered in connection with the evening classes at the Centennial evening school, Pueblo, Colo.

New Continuation School. A new school for the exclusive use of working boys and girls will shortly be erected in the northeast section of Philadelphia. The building will be completely equipped for all forms of shopwork and will be erected at a cost of approximately $1,200,000.



Substantial!

That's the one word that best describes this lathe. It's a compact, complete unit—built a little heavier, and stronger than any other you can buy at the price.

That extra weight and strength means much in the school shop. Inexperienced students put machinery under terrific strain with their mistakes. This lathe will stand up even under such abuse.

Geared head type, with motor mounted in the cabinet leg, it has no belts to endanger students or to obstruct the instructor's view.

Write for Illustrated Bulletin and full details of this sturdy, practical, lathe. Already in use in hundreds of practical production shops and school shops throughout the country. Address 403.

The Sidney Machine Tool Co:,
Sidney, Ohio.

12″ x 5′
Motor
Driven
Lathe

SIDNEY

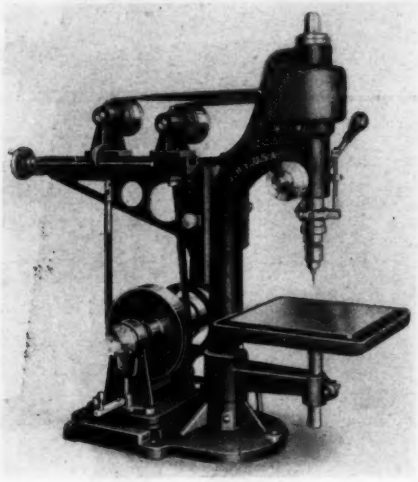
Built and
Sidney
Guaranteed.

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor and Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

A NEW VARIABLE SPEED DRILL

The new 12" Hi-Speed Drill manufactured by the Buffalo Forge Co. of Buffalo, N. Y., has an application in the junior high-school shops as well as the trade-school shop. The drill is so constructed that four different speeds are obtained. These speeds are 3600, 4800, 7200 and 10,000 r. p. m. Changes of speed are quickly made by a lever and a quick-acting screw, which encourages the operator to change to the proper speed for the work he is performing. Breakage of drills when running at improper speed is great, hence, with a drill of this type the breakage is considerably reduced, and also better workmanship is possible.

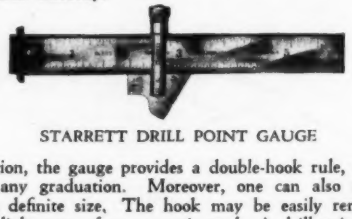


12" HI-SPEED DRILL.

The machine is of ball-bearing construction throughout, being equipped with a No. 30 Jacobs balanced chuck with a capacity from 0 to $\frac{5}{16}$ inches. The new 12" speed drill is also built for direct motor drive. The overall height of the drill is 34"; the travel of the spindle 3½"; spindle diameter $\frac{7}{8}$", and the speed of the drive pulley is 1800 r. p. m. from which the four speeds as mentioned above can be obtained.

A NEW GAUGE

The new No. 22 C drill point gauge manufactured by the L. S. Starrett Co. of Athol, Mass., consists of a 6" steel rule with a sliding head which makes contact with the rule. This tool combines drill-point gauge, hook rule, plain rule, depth gauge, try-square, and side caliper. It will be of great benefit to teacher and student, because the teacher is better able to demonstrate the sharpening of small drills accurately, and the student is better able to check whether he has ground his drill correctly.



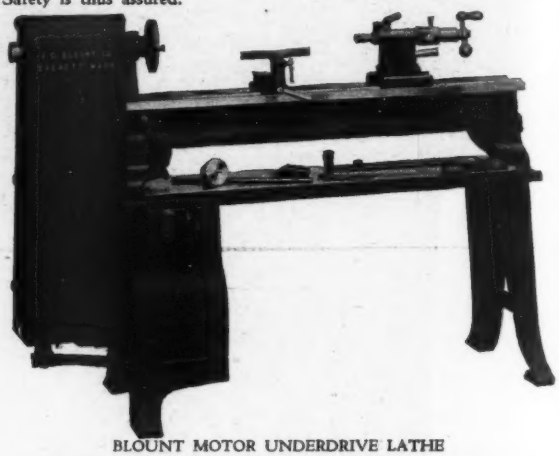
STARRETT DRILL POINT GAUGE

In addition, the gauge provides a double-hook rule, which can be adjusted to any graduation. Moreover, one can also use it to set calipers to a definite size. The hook may be easily removed or adjusted by a slight turn of an eccentric stud. A drill point gauge head is furnished separately to those already owning the Starrett No. 114 hook rule or to those who own Nos. 300 or 600 Starrett plane rule.

ANOTHER BLOUNT LATHE

The J. G. Blount Co., Everett, Mass., announce several improvements in the design of their motor underdrive lathe. The most important is increased safety in operation and an easy positive method of belt shifting.

Basically, the design of the machine is unchanged. The drive is by belt to headstock from a motor mounted on a plate adjustable to belt tension, pivoted in an enclosing cabinet-type headstock leg. The motor cone is pressed on to an extended motor shaft. A close-fitting steel guard encloses the head end of the lathe, making it impossible for the operator to become entangled with the belt or moving parts. The motor leg is dustproof as well as a protection to student. Safety is thus assured.



BLOUNT MOTOR UNDERDRIVE LATHE

Speed variation has been simplified by the addition of a single hand lever operated belt shifter. This device makes possible the elimination of idler pulleys and several parts, thus attaining extreme simplicity. Since the belt tension is constant, much wear of the belt is eliminated. It prevents jamming of the belt and the possibility of the belt slipping off the cones. The simple moving of the hand lever through an arc of about 60° is all there is to shifting from low to high speed.

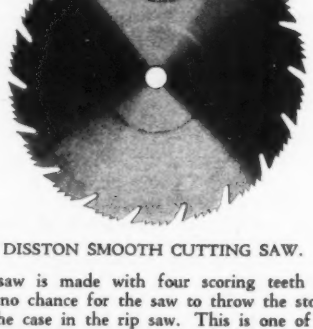
This lathe may be obtained with plain open side tailstock and turning rest holder with rests, or with a special bed fitted with hand-feed carriage, compound rest and set-over-swivel tailstock. The headstocks are obtainable in two styles, either with ring-oiling bronze bearings or with heavy duty, deep-groove type ball bearings. Throughout the lathe is built to the same sturdy design as other Blount lathes, and is adaptable to work on metal or wood.

NEW CIRCULAR SAW

Henry Disston & Sons have perfected an improved circular saw known as the Disston Smooth Cutting Saw.

This saw should prove to be of great interest to teachers of woodwork because it will rip, crosscut, and do mitering work equally well.

Moreover, perfect joints can be made with this saw without planing them.



DISSTON SMOOTH CUTTING SAW.

Since the saw is made with four scoring teeth and one raker section there is no chance for the saw to throw the stock back to the operator as is the case in the rip saw. This is one of the fine safety features of this type of saw, and hence, should become a popular saw in the school shop.

The saw blade is hollow ground, which eliminates setting and swaging of teeth, and provides ample clearance for the saw to work without binding.—F. W. Z.

NEW BOOKS

Pewter Design and Construction

By William H. Varnum. Cloth, Royal octavo. 148 pages. Price, $3.50. Bruce, Milwaukee.

This book is a careful statement of the technique of working pewter by present-day hand methods. As the author indicates, it is the result of 23 years of contact with art metalwork in an effort to secure a metal entirely suited to the constructive abilities of students, amateurs, and craftsmen. Five years of extended use of the excellent present-day grades of pewter have amply proved wholly unexpected values of the material as a means of expression, as a source of new and artistic problems, and as an opportunity for developing new methods of procedure.

The introductory and closing chapters stress the history of pewter and give the user of the book an insight into ideals and practices of the old pewter workers. The body of the book is devoted to detailed statements of the approach to design, and the technique of making a series of useful and artistic articles. Tools are illustrated and described and tool processes are fully treated. The typical processes of bending, seaming, soldering, spout and cover construction, casting and turning, mold construction and casting, and high-raising and forging, are all applied in appropriate problems.

The teacher who is seeking inspiration and help will find the book complete with illustrations and descriptions of processes and entirely suited for classwork in art metalwork.

Glass and Glazing

By Emanuel E. Ericson. Cloth, 146 pages, illustrated. Price $1.75. Published by The Manual Arts Press, Peoria, Ill.

This book not only tells the history of glassmaking, but it forms an instructive textbook for all those who wish to work in glass or utilize glass in household paraphernalia, in buildings, or for other purposes.

The characteristics of all kinds of glass, the art of cutting glass, and the necessary equipment therefor, the placing and setting of glass, and the treatment of mirrors—all is well explained.

Arc Welding

Paper, illustrated. 160 pages. Price, $1.50. Published by The Lincoln Electric Co., Cleveland, Ohio.

This book, which is without preface or introductory, deals with the newer methods of manipulating iron and steel, and discusses more particularly the use of electric-arc welding. The process employed in this mode of welding is thoroughly explained, the relative merits of cast iron and steel is set forth, and the products are demonstrated.

The equipment necessary for an arc-welding plant is well described in word and picture. In fact, the book is well illustrated.

PUBLICATIONS RECEIVED

Score Cards for Judging Clothing Selection and Construction. By Ruth O'Brien, Maude Campbell, and Mary Davis. Circular 90-M, January, 1927, issued by the U. S. Department of Agriculture, Washington, D. C. The score cards given here are not suggested as ideal but are offered in the hope that they may be one step in bringing some uniformity in the great variety now being used. They are the result of a study of clothing score cards from many sources and are offered as a means of establishing uniformity in the great variety of cards now used. The pamphlet displays typical score cards for judging clothing selection, clothing construction, and group exhibits of clothing and household textiles. The pamphlet sells at five cents per copy and may be obtained from the Superintendent of Documents, Washington, D. C.

NEWS NOTES

Directed Practical Work in Agriculture in New Hampshire. The supervisor of agriculture for the State Department of Education of New Hampshire has issued a pamphlet in which he discusses the technical information necessary for a farm boy and the responsibility of the teacher in providing varied experience through a variety of farm jobs. As a help in this work, Mr. C. H. Young, supervisor of agriculture, has prepared a very practical graph showing the different farm jobs each boy must acquire skill in doing. A recording chart can be successfully used in indicating what each boy accomplishes.

Mr. Young has adopted ten criteria for use in setting up a skill-acquiring program in farm activities and outlines the essentials of a good project. The project work yields good financial returns and demonstrates desirable agricultural practices. The project work must typify as nearly as possible the farming of the school's patronage area and the project must be continuous. A full four-year project program is suggested for each pupil, the program to be worked out with the cooperation of the parent, the boy, and the teacher.

Evening Vocational Classes. During the past season, free evening schools were conducted in four different centers at Erie, Pa., offering courses in nearly fifty subjects. Among the subjects taught were commercial work, mechanical drawing, sheet-metal drawing, steel square practice, millinery, machine design, architectural drawing, machine shop practice, electricity, shop mathematics, slide rule, sewing, cooking, art, printing, and builders' mathematics.

Every Manual Training Class Room *should have this Complete Set of* IRWIN BITS

THIS set of genuine Irwin Auger Bits, ranging in 16ths of an inch, from one-quarter inch to one inch, is deserving of a place in every well equipped manual training or industrial arts workshop.

The thirteen auger bits comprising the set are all Irwin Mainbor Bits, made with the solid-center principle originated by Irwin 41 years ago.

Kept intact in the original container—Borcase or Borkit—they will remain in perfect condition indefinitely.

Write to us, mentioning this advertisement, and we will be glad to give you details regarding special introductory offer.

Write for the facts today.

THE IRWIN AUGER BIT COMPANY
Wilmington, Ohio.

"Largest Makers of Wood-Boring Tools in the World."

IRWIN *Auger Bits*

AN ASSISTANT TO BE RELIED UPON

12x18 Kluge Craftsman Efficiency Unit

The printing-course graduate about to embark upon the sea of competition will be glad to know of ***one*** able assistant that will work for and with him in his future career. He will find the

KLUGE FEEDER

a most reliable partner in turning out good conscientious work at a minimum of expense. It needs no more time and attention than does the human feeder, but does quicker work and accomplishes far more.

Let us tell you more about the Kluge.

Brandtjen & Kluge, Inc.

Manufacturers

Saint Paul, Minnesota

Branches

with operating exhibits

New York, Chicago, St. Louis, Detroit.

New Vocational Classes. Vocational classes in cost calculating, shaft designing, and sample analysis have been formed at the vocational school, Paterson, N. J. In addition to these courses, there are textile classes in twisting, entering, and reeding, weaving, and fixing.

Vocational School Completes Successful Term. The vocational evening school at Greensboro, N. C., completed its most successful term in December. The school offers courses in plumbing, lead wiping, architectural drawing, electricity, steam fitting, and automechanics.

Cooking, sewing, music, science, shopwork, and agriculture were added to the course of study of the junior high school at Malad City, Idaho. The work is intended to offer opportunity for more practical work and to stimulate a desire to remain in the high school.

The teachers of the Continuation Schools of Newark, N. J., have formed an association to further and better their cause. Recently their principals, Mr. Thomas F. McHugh of the Boys' School, and Miss Mary E. Jones of the Girls' School, were their guests. The discussion centered around the qualifications for such work.

Prepare for Vocational Guidance Week. How New Orleans children study occupations with a view of finding their proper place in the business or industrial world will be demonstrated for vocational guidance experts during the observance of vocational guidance week, beginning with April 18th. The children chosen for the demonstrations will show how occupational studies are planned, and will describe their visits to local factories and business houses under the guidance of their counselors.

Survey of Vocational Situation. A survey of the vocational education problem has been made in fifty schools in eastern Washington by members of the educational department of the Washington State College as a means of collecting data on the possibilities and opportunities in this field.

New Manual Training Department. A manual training department has been established in the Brookside School, Bridgeport, W. Va.

Manual Training Classes Opened. Manual training classes for boys have been established by the Pines Community Center at Decatur, Ill. The classes made a number of articles for the Christmas season, which included letter-openers, work boxes, and necktie racks. Under the arrangement, the Community Center furnishes tools and equipment for a class of twenty boys.

Sheet Metal Work. The west side board of education at Aurora, Ill., has included sheet metal work in the course of study in manual training. The cost of the equipment will reach $275. The work which began with the second term, is open to eighth grade students. It is planned later to introduce concrete and electrical work.

Prevocational Training in Continuation School. The purpose of the training offered in the Continuation School at Lancaster, Pa., is to offer prevocational experience and training to boys previous to entering a trade or industry. After they have completed the course, they are given an opportunity for actual participation in various shop activities. The experience is considered valuable in bringing out latent abilities and talents, and the toys made by these pupils are an example of the excellent work that boys from 14 to 16 years can do.

There are 210 boys in the continuation school, who out of eight hours a week in school, spend an hour and a quarter in the school shops. The boys are divided into two groups, the younger boys working in the wood shop under the direction of Mr. William Brock of the Boys' High School, and the older boys pursuing manual training work in the machine and sheet metal shop in the West End Junior High School under the direction of Mr. George McLaughlin.

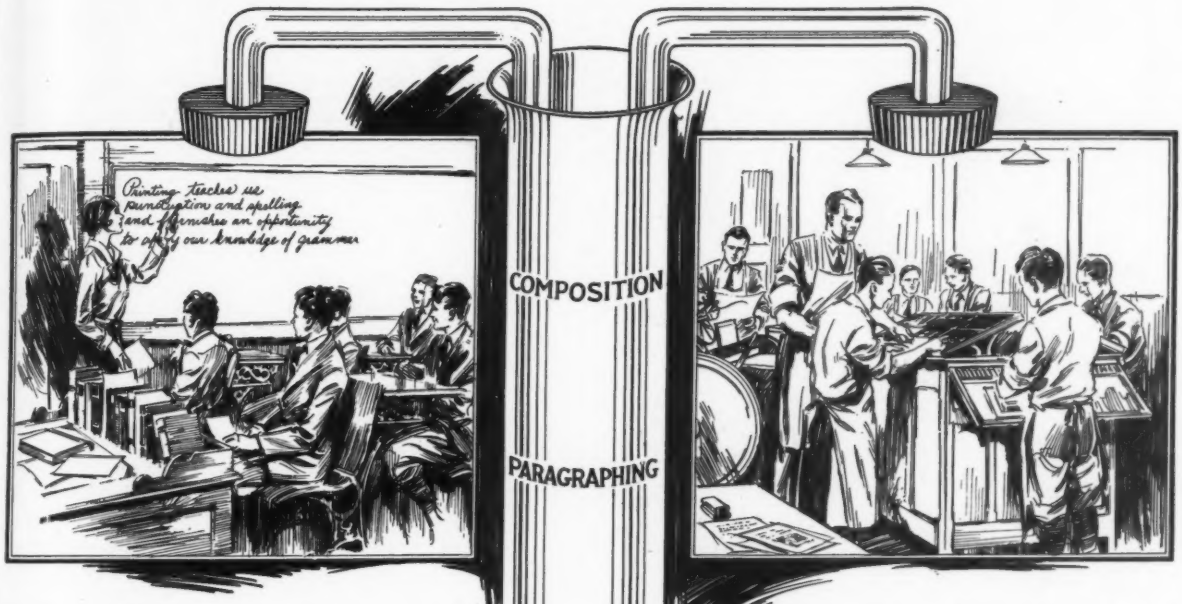
Group Method Introduced. The group method of instruction was introduced in the Boys' High School, Lancaster, Pa., last fall, and has proven so successful that it is planned to continue the experiment.

The change to the production basis in the wood shop was accomplished under the direction of Mr. W. E. Brunton, supervisor of manual arts. Formerly, in all the schools, each pupil made his bench or table from start to finish. In the Continuation School, it was found advisable to put the work on the production basis so that all the wheels, all the handles, the assembling, and painting might be carried out by certain boys. To avoid the monotony of the same job all the time, and to give the boys experience in making all the parts, the jobs are rotated each week or so. In this way, while the boy does not work on his own particular toy through the entire process, still he has gone through the process in a large number of toys. A foreman in each class is appointed to assist the instructor, and the enthusiasm and ambition of the boys is aroused through the effective use of teamwork.

The method has proven economical through the elimination of waste material, while the production both in time and quantity has been considerably larger.

THE TEST OF PRINTING

The Conclusions of Prominent Educators



William J. Bogan, Assistant Superintendent of Schools of the Department of Education, Chicago, writes: "Through its strong appeal to boys, the printing course has acquired great importance in the Junior High School. The practical value of printing is great, for aside from its trade features, it appeals alike to the artist, the advertiser, the editor, the reporter, the business man, the author."

Emma V. Tindal, Principal of the Oliver Wendell Holmes Junior High School, Philadelphia, Pa., writes: "To my mind, printing is an educational agency of undoubted value. When included in a school curriculum, it may be employed to motivate instruction in various studies, such as punctuation, composition, grammar, spelling, mathematics, science, and art. And it will also afford an opportunity for acquired and worth-while manual skill."

Susan Dorsey, Superintendent of Schools, Los Angeles, California, writes: "It is a matter of importance that through the school printshop a large number of young people have become familiar with the different styles of type, with the setting up of forms, and with the vocabulary of printing, and the related arts of making cuts, prints and the like."

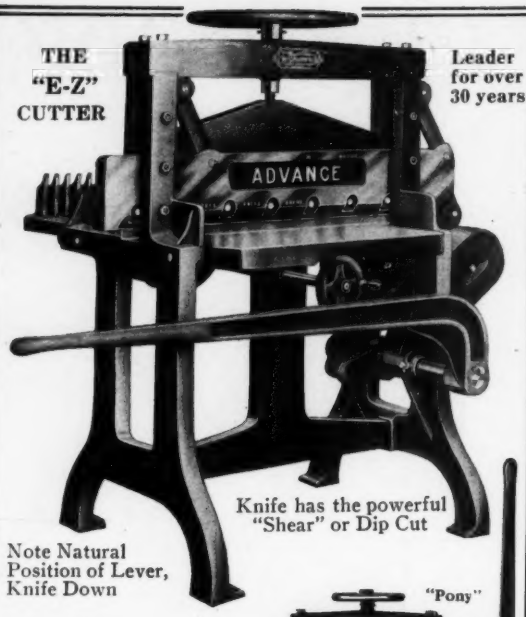
James M. Glass, Director of Junior High Schools, Commonwealth of Pennsylvania, writes: "Printing is incorporated into Junior High School program of studies in a majority of instances as part of a general shop organization. The aim is not vocational education, but general industrial arts training. Where the tryout purposes of a general shop need not be restricted to the industrial activities of a given community it seems advisable to add printing as one of the projects of a general shop plan."

FOR INFORMATION REGARDING PRINTING INSTALLATIONS, WRITE

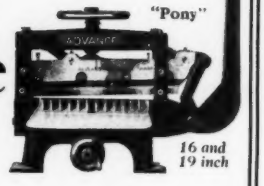
F. K. PHILLIPS, *Manager,* EDUCATION DEPARTMENT

AMERICAN TYPE FOUNDERS COMPANY

THREE HUNDRED COMMUNIPAW AVENUE, JERSEY CITY; N. J.



"Pony"



16 and 19 inch

Advance Cutters

Advance Lever Paper Cutters are made in four sizes, from the 16- and 19-inch "Pony," with or without iron stand, to the sturdy 26½- and 30½-inch sizes illustrated above.

Send today for full information regarding Advance Cutters and ask for literature describing any of the following machines and utilities used throughout the world in the Graphic Arts:

Diamond Power Paper Cutters
Lee Two-Revolution Cylinder Presses
Hoerner Combination Type-High Machine
Mercantile Addressing Machine
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Challenge Pressed Steel Galleys
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ARE SOLD BY ALL LIVE DEALERS EVERYWHERE

The Challenge Machinery Co.

GRAND HAVEN, MICHIGAN

Chicago, 17-19 E. Austin Ave. New York, 220 W. 19th St.

PERSONAL NEWS NOTES

Mr. James A. Hoskins, of Ames, Iowa, has been appointed as instructor in the vocational department of the high school at Lincoln, Nebr.

Mr. Louis M. Rowe, who has been a manual-training instructor in Los Angeles for several years, has been appointed as assistant supervisor of the manual-training department. Mr. Rowe is a graduate of the Bellingham, Wash., Normal School and has had eight years' experience as a principal. He came to Los Angeles seven years ago and during that time has been employed as a manual-training instructor. His promotion to the assistant supervisorship came as a result of his recognized skill as a teacher and other superior qualifications.

Mr. Rowe has been assigned to the task of developing elementary construction and finishing processes of woodwork in the department.

Mr. A. E. McArthur of McGill, Nevada, has been appointed as state supervisor of vocational education for Nevada.

Mr. O. D. Backus, of St Louis, Mo., has been appointed head of the printing department in the Wheeling, W. Va., high school.

Mr. C. M. Newcomb, of Pine Bluff, Ark., has been appointed director of Smith-Hughes vocational training. He succeeds A. L. Burns, who resigned. Mr. Newcomb was formerly head of the manual-arts department in the Pine Bluff high school.

Dr. Arthur Frank Payne, formerly of Columbia University, has announced the opening of a psychological guidance clinic for the clinical analysis of children, adolescents, and adults. The clinic is located at 65 Park Avenue, corner of 38th St., New York, N. Y.

Dr. Payne has conducted a number of practical courses for industrial superintendents, employment managers, and foremen. He also conducts a course for teachers telling how to apply vocational and educational guidance.

Mr. Harold B. Chapman, formerly of Columbus, Ohio, has been appointed assistant director of the Bureau of Research at Baltimore, Md., to succeed Mr. Edwin Hebden, who retired in October. Mr. Chapman is a graduate of Yale University. He spent one year in residence at Teachers' College, where he received the degree of master of arts. He also spent two years at Ohio University, from which he received a doctor's degree, together with an appointment as assistant professor.

Mr. John F. Lee, president of the board of trustees of the Ranken School of Mechanical Trades, St. Louis, Mo., died on November 28th, at the age of 78 years. He was one of the first trustees to be selected by Mr. Ranken and had been with the school for the last fourteen years.

DUDLEY MAYS HUGHES PASSES

Mr. Dudley Mays Hughes, one of the pioneer leaders in the movement for the promotion of vocational education in the United States, died at Danville, Georgia, on Thursday, January 20. Mr. Hughes was born at Jeffersonville, Georgia, in October, 1848. He attended the country schools and the University of Georgia. In 1871 he engaged in agricultural pursuits and in 1882 he became a member of the State Senate. He was a trustee of the Danville school, the State Normal Institute, the University of Georgia, and the Georgia State Agricultural College.

Mr. Hughes was one of the nine members of the Commission on National Aid to Vocational Education appointed to determine what the Federal Government could do in promoting vocational work in the United States. The recommendations of the Commission were adopted and resulted in the approval of the National Vocational Education law. The law was the result of a bill introduced jointly by Mr. Hughes and Senator Hoke Smith of Georgia. Of the membership of nine at the time of the passage of the law, only three are in Congress today.

Los Angeles Woodworking Instructors Meet. The woodworking instructors of the Los Angeles high schools held a meeting at the Warehouse, December 14th. Mr. Arthur Gould, assistant superintendent, was in charge of the meeting. Mr. W. Record, business manager of the school system, led the trip of inspection, which was followed by instructive talks by members of the business department staff.

New Policy in Handling the Cost of Materials. The board of education at Mason City, Ill., has adopted a new policy in handling the cost of sewing materials in the home economics classes of the high school. In the past, girls who desired to take the course have been deprived of the instruction because of the cost of the necessary materials.

Under the new plan, the girls purchase their own materials and present their sales tickets to the instructor for approval. These tickets are then presented to Supt. J. I. Lynch, who issues checks on the high school fund. At the close of the year the board reimburses the high school for the amounts paid out. Each girl who purchases material is reimbursed by the school to the amount of seven dollars.

Under the new arrangement there has been a noticeable increase in enrollment in sewing classes, and no girl is deprived of the instruction because of the expense involved.

Let your pupils capture the tints of Spring with "Prang" Water Colors

Color is the Spirit of Spring. The magic of brightening lawns, the bold crocuses, the buds pushing out tentatively to test the temperature, call for expressions in color.

Give your pupils a black and white line drawing of a dreary winter scene (without snow). Tell them to take their water colors and show what Spring does to a scene like this. Let them express what *they* feel.

Similarly, brilliant color should enter into every *other* problem at this season. Thus the wise teacher takes advantage of this great tide of interest in nature's artistry.

Art instructors can obtain from us, free, many suggestions describing various uses for "Prang" Water Colors.

Regarding "Prang" Colors, make sure that the name "Prang" appears on the box - otherwise it is not "Prang."

"Prang" Water Colors and "Prang" Crayons are manufactured and owned only by The American Crayon Company. It alone is the original source of supply.

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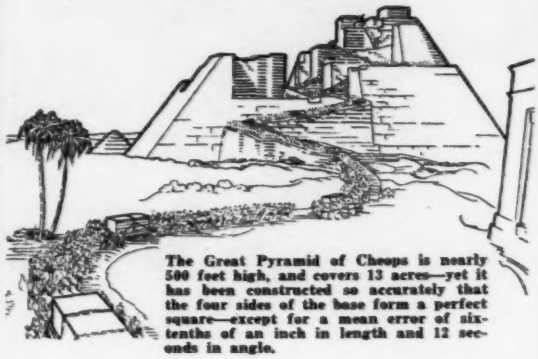

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THE TEACHING LOAD AND THE CLASS PERIOD IN INDUSTRIAL ARTS

A recent report on a survey of the school system of Racine, Wis., gives the findings of the special committee on the status of industrial-arts work. The survey was conducted by Mr. S. Lewis Land and Mr. A. H. Edgerton, under the direction of Mr. A. S. Barr of the University of Wisconsin, and is divided into three parts: Industrial arts in the elementary school, in the junior high school, and in the senior high school.

The report devotes considerable attention to the length of the class period and the teaching load. As a result of its studies, the committee recommended that there be more uniformity in the time devoted to industrial-arts subjects in the several elementary and secondary schools, and that provision be made for closer cooperation of shopwork and mechanical drawing in the junior and senior high schools. In the matter of the teaching load, it was recommended that 20 be set as the average number of pupils for a class, with 15 as a minimum, and 25 as a maximum. Teachers would be given one free hour from teaching duties, this time to be devoted to other work.

In discussing the subject of teaching load in elementary, junior, and senior industrial-arts classes, it was brought out that in the elementary schools, one teacher of woodworking travels among five schools, teaches 21 classes a week, and completes 302 hours of work, leaving nine free periods each week; a second teacher has three classes per week and completes 50 pupil hours of work; a third teacher conducts three class periods and completes 62 pupil hours of work; a fourth teacher has three class periods and completes 57 pupil hours of work, and a fifth teacher has four class periods and completes 52 pupil hours of work.

A further study relates to the size of classes in woodworking. In the study it is shown that three schools have one class each of 20 to 24 pupils, one school has two classes, and two schools have two classes each of 20 to 24 pupils; five schools have two classes of 15 to 19 pupils, two schools have three classes, and one school has four classes of 15 to 19 pupils; one school has one class, and one has four classes of 10 to 14 pupils; four schools have one class each of five to nine pupils; one school has one class of four pupils. In the nine schools, there are seven classes of 20 to 24 pupils, 20 of 15 to 19 pupils, five of 10 to 14 pupils; four of five to nine pupils, and one of four pupils, making a total of 37 classes in all. The highest median was 20, and the lowest 12.5. The average total for all classes was 15.8.

A third study was conducted on the character of the instruction, taking up such phases as the length of the class period, the number of periods of weekly instruction, and the number of instruction periods per year. In this study it was found that the teaching load was 90 minutes in three schools, 75 minutes in three schools, 70 minutes in one school, 60 minutes in two schools, and 55 minutes in one school. The average for all the schools was 74.5. The number of weekly periods of instruction varied from one to six, with an average of five for all schools. The number of instruction periods per year varied from 37 to 40, with an average of 39.7 for all schools.

In a study of junior high schools it was brought out that one instructor in woodworking has 27 classes per week, one has 28 classes, and one has 25 classes per week; one instructor in mechanical drawing has 27 classes, one had 25 classes, and one has 26 classes per week.

In regard to the length of class periods and class sizes, it was found that in the woodworking classes, one school has five classes of 25 to 29 pupils; one school has one class, and two schools have three classes of 20 to 24 pupils; one school has five classes of 15 to 19 pupils; one has five classes of 10 to 14 pupils, one has one class, and one has two classes of 10 to 14 pupils. The highest median was 24.1, and the lowest was 15.5, with an average of 17 for all three schools.

The length of the class period in junior high schools is 55 minutes in three schools; the number of weekly periods of instruction is 3.6, and the number of instruction periods per year is 40. The average length of the class period in all schools is 55; the average number of periods is 3.6, and the average number of weeks per year is 40 for all three schools.

In the senior high school, the study showed that one class has 25 to 29 pupils; six classes have from 20 to 24 pupils; four classes have 15 to 19 pupils; one class has 10 to 14 pupils; two classes have five to nine pupils, and one class has four pupils. There was a total of 15 classes with a median of 19.3.

A CORRECTION

A news item in the February issue of the INDUSTRIAL-ARTS MAGAZINE stated that a new procedure has been introduced for handling the cost of materials in elementary and junior high-school shops. Mr. Edward C. Emerson, to whom the statement was credited, writes that no change in policy has taken place in the Boston schools and that none is in contemplation at the present time.

Urge Restoration of Vocational Appropriation. At a recent meeting of the Texas Federation of Women's Clubs, a resolution was adopted urging a restoration of the state vocational education appropriation vetoed by Governor Mirian A. Ferguson. Dan Moody, governor-elect, urged the acceptance of federal funds in his campaign for election.